Estimation of Instream Discharge for Passage of Anadromous Fish Through Critical Riffles in Stevens and Coyote Creeks, Santa Clara County

Balance
Hydrologics, Inc.

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The Santa Clara Valley Water District

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1. INTRODUCTION AND SUMMARY OF WORK COMPLETED

1.1 Project purpose and background

Balance Hydrologics was asked by members of a third-party Technical Advisory Committee (TAC)[1] to estimate passage flows for anadromous fish through identified critical riffles[2] on Stevens and Coyote Creeks in the Santa Clara Valley. Passage flow estimation for this project was based on meeting a modified version of the criteria developed by Thompson (1972). Thompson (1972) defined passage flow criteria for adult coho (*Oncorhynchus kisutch)* and rainbow steelhead trout (*Oncorhynchus mykiss irideus*) as that streamflow which would result in a water depth of 0.6 feet over 25 percent or a continuous 10 percent of the total channel cross-sectional width. Passage flow criteria for adult chinook salmon (*Oncorhynchus tshawytscha)* was determined to be 0.8 feet over the same percentage of channel width by Thompson. We applied Thompson's passage flow criteria in this project as that streamflow which would result in a water depth of 0.8 feet at one station for each cross-section at all critical riffles. Results from this project will be used by the Santa Clara Valley Water District (Water District) in making decisions regarding the need for additional water releases from upstream reservoirs during periods of up-migration. This project is part of a larger effort headed by the Water District to measure the condition of habitat for chinook salmon, rainbow steelhead trout and other native fish species in several streams within Santa Clara County.

1.2 Summary of work completed

Stacy Li (project fisheries biologist), Ed Ballman and Shawn Chartrand identified several critical riffle locations on Stevens and Coyote Creeks that provide a representative set of morphologic and hydraulic characteristics. A total of six riffles on Stevens Creek and five on Coyote Creek were chosen and then level-surveyed and monumented by Balance staff under the direction of Shawn Chartrand.[3] On Stevens Creek, the sites identified and measured extend from the Chestnut Picnic Area in Stevens Creek Park downstream to the Fremont Road Bridge (see Figures 1 and 2). On Coyote Creek, the sites identified and measured extend from the Anderson Dam County Park Area in Morgan Hill downstream to the Tully Road bridge (Figures 1 and 3). Attempts were made to access another site at Storey Road, but were abandoned due to difficulties with access.[4]

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[1] Members of the TAC were working with the Fisheries and Aquatic Habitat Collaborative Effort (FAHCE) and the Santa Clara Valley Water District.

[2] In this project, critical riffles included naturally occurring bed structures which have the potential to act as passage impediments to migrating fish. Riffles are generally built with pebble to gravel sized material (2 to 256 millimeters) oriented more or less transverse to the direction of flow. Flows are typically more shallow over riffles than in reaches upstream or downstream from riffle occurrences.

Discharge measurements were taken on the same day in which critical riffles were level-surveyed. A total of six survey-calibrated discharge measurements were taken on Stevens Creek and four on Coyote Creek. A discharge measurement was not taken during surveying at the Coyote 2 riffle due to its proximity to the Coyote 1 riffle. For Stevens Creek, two additional discharge measurements were taken in January and February of 2001 during periods of higher streamflow. These additional discharge measurements were taken to further refine the estimates of passage flows on Stevens Creek.

Balance Hydrologics staff subsequently set up hydraulic models for each critical riffle to assess whether readily available modeling software could replicate the observed field data. This work used the U.S. Army Corps of Engineers' HEC-RAS software, a standard one-dimensional steady-state hydraulic model. The hydraulic model for each critical riffle was developed with the survey data and calibrated to the water surface elevations for the measured stream flows. Additional modeling was carried out through an iterative process to estimate the respective passage discharge. As discussed in Section 1.1, passage discharge was defined as that streamflow which would result in a water depth of at least 0.8 feet at one location through all cross-sections measured within each critical riffle.

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[3] Each riffle was given an identifying name for data collection purposes. The work on Stevens Creek was carried out first and the riffles were generally given names based on their location. For Coyote Creek, nomenclature was simplified, with each riffle being given a number from 1 to 5 ascending downstream.

[4] From the bridge, the Storey Road crossing appears to be similar in structure to the Tully Road crossing. We can only speculate that the Storey Road crossing would require at least the equivalent passage discharge as that estimated for Tully Road. Any future attempts to access the Storey Road crossing will require the concerted efforts of our staff and Santa Clara Valley Water District Staff.

2. GEOGRAPHIC SETTING AND CHANNEL CHARACTERISTICS

2.1 Geographic setting and project location

The Santa Clara Valley is situated at the southern end of the San Francisco Bay and is bordered on the west by the Santa Cruz Mountains and on the east by the Diablo Range (Figure 1). The lower reaches of both Stevens Creek and Coyote Creek are in the Santa Clara Valley with Stevens Creek located on the western side of the valley and Coyote Creek located on the eastern side. The reach of Stevens Creek examined as a part of this project extends from the Chestnut Picnic Area in Stevens Creek Park to the Fremont Road crossing (Figure 1). The reach of Coyote Creek examined extends from just below the Anderson Dam Spillway to the Tully Road crossing (Figure 1). Summary of the regional hydrologic and geologic setting can be found in RRM Design Group and Balance Hydrologics, 1999.

2.2 Location of critical riffles

Which geomorphic characterization of the riffles was not part of the project scope, it warrants mentioned that all riffles are downstream of major dams, and are developing inset terraces (see below). The riffles were probably are modified by high flows in 1995 and 1998, with minor changes in subsequent years.

2.2.1 Stevens Creek critical riffles

Each critical riffle location included in this study for Stevens Creek is described below and is illustrated in Figure 2.

Two riffles were measured on Stevens Creek Park lands near the Chestnut Picnic Area. The first riffle, designated Steep Chestnut, is located roughly 100 feet downstream of the metal clad footbridge that is accessed from the extreme northeast corner of the parking lot at the day use area. The second riffle, designated BH-3 Chestnut Picnic, is located roughly 400 feet downstream from the Steep Chestnut riffle and is accessed via a trail which is marked by a 3-foot piece of broken concrete on the ground after a short section of dense riparian vegetation.

Two riffles (the fourth and fifth) were measured at the McClellan Ranch Nature Center. Both riffles are accessed via the interpretive path along the creek running downstream from the nature center parking lot. The first riffle, designated Steep McClellan, is located near where the interpretive trail meets an amphitheater. The second site, designated McClellan Ranch, is located roughly 700 feet downstream of the Steep McClellan riffle near the gardening plots. This riffle lies beneath a canopy produced by several very large sycamores with a wooden tie stairway on the right bank leading down to the creek.

The fifth and sixth riffles are located near the Homestead Road and Fremont Road crossings. The Homestead Road riffle is located roughly 600 feet downstream of the crossing and below a concrete drop structure. The site is marked by the extensive bank protection work that has occurred on the right bank behind the apartment complex. The Fremont Road riffle is located directly under the bridge crossing and extends for roughly 150 feet downstream of the crossing.

2.2.2 Coyote Creek critical riffles

A description of each riffle location included in this study for Coyote Creek is given below with locations illustrated in Figure 3.

Two riffles were measured at a distance of approximately one mile downstream of the spillway for Anderson Dam near the intersection of Cochrane and Malaguerra Roads. These sites were named Coyote 1 and Coyote 2. Roughly one-fifth of a mile separate the two locations. The third site is located roughly one-quarter mile downstream of the Anderson Lake County Park ranger office and is referred to as Coyote 3. The fourth site is located near the entrance to the Santa Clara County Model Airplane Park, where the bike path crosses the road leading back to the Park. This site was named Coyote 4. The fifth site is located under the Tully Road crossing and was named Coyote 5.

2.3 Physical characteristics of the Stevens Creek critical riffles

A summary of the characteristics for the Stevens Creek riffles is given in Table 1, with photographs of the riffles presented in Figures 4 through 9. These riffles range in length from 38 feet at Steep Chestnut to 175 feet at Fremont Road. The widths of the critical riffles on Stevens Creek range from 17 feet at Steep Chestnut and Steep McClellan to 24 feet at the BH-3 Chestnut riffle. Low-flow critical riffle slopes range from 1.6 percent at Fremont Road to 4.1 percent at Steep Chestnut[5]. Visual estimates of the 50th percentile grain size of the channel bed material for each riffle on Stevens Creek range from coarse pebbles to small cobbles (16 millimeters to 128 millimeters). The estimated embeddedness[6] of the bed material ranges from 10 percent to 40 percent. Additionally, the channel reaches where the critical riffles are located are incised and detached from the adjacent, historic floodplain[7]. At all of the critical riffle locations except Fremont Road, the channel has built small floodplain terraces situated roughly 3 feet above the channel bed with widths ranging from 5 to 8 feet.

2.3.1 Steep Chestnut critical riffle

Steep Chestnut can generally be characterized as a short, steep riffle. In fact, with a bed slope of 4.1 percent, it is the steepest of the six critical riffles investigated on Stevens Creek.[8] The average width of Steep Chestnut is 17.8 feet (the second narrowest of the Stevens Creek riffles) and the riffle length is 38 feet. The riffle geometry is controlled by a near vertical left bank[9] roughly 50 feet in height and a steep right bank roughly seven feet in height. The channel bed geometry at the time of the survey included a cross-sloping bed to the southeast, which concentrates flow on the right side of the channel. Flow concentration on the right side of the channel and lack of sediment replenishment from upstream sources has resulted in accelerated soil loss from the right channel bank through this reach (see Figure 4). In general, the channel bed at Steep Chestnut is well organized with a clear riffle-pool sequence.

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[5] Low flow riffle slope is defined as the difference between the average water surface elevations from the riffle crest to the riffle toe divided by the tangential distance between these points.

[6] Definition of embeddedness : rocks or portion of rocks at the surface of a streambed that are buried in finer sediment. Measurements of embeddedness provide information about the amount of resting of refuge habitat available for juvenile and yearling salmonids.

[7] The adjacent, historic floodplain at the Chestnut, McClellan Ranch and Homestead Road critical riffles is situated roughly 7 to 10 feet above the channel bed. The Fremont Road riffle cannot be characterized as such due to the occurrence of the Fremont Road Bridge.

[8] It should be recognized that bed slopes presented in this report represent measurements made in November 2000, December 2000 and January 2001. Bed slopes at each location modeled may have changed since the level-survey work was completed.

[9] Looking downstream. All references to left or right bank use the convention of a downstream orientation.

2.3.2 BH-3 Chestnut critical riffle

BH-3 Chestnut has a bed slope of 3.9 percent, an average width of 24 feet and a total length of 44 feet. In general, this riffle can be characterized as a wide but also steep riffle. This is contrary to our initial observations that classified this as one of the less steep riffles. Channel geometry at this location is in part controlled by a very steep left (north) bank that has been subject to accelerated soil loss, as illustrated by the exposed roots. Roughly 100 feet downstream of the BH-3 critical riffle, substantial amounts of large wood have blocked the channel. It is likely that some of this large wood originated from the north bank adjacent to the BH-3 Chestnut riffle.

2.3.3 Steep McClellan critical riffle

The Steep McClellan critical riffle slope of 2.6 percent is much less than the 4.1 percent slope of its corollary riffle, Steep Chestnut. Initially, Steep McClellan and Steep Chestnut were considered to be similar in grade based on observations noted during the Stevens Creek stream reconnaissance. The average width of Steep McClellan is 17.2 feet with a total length of 53.6 feet. The stream through Steep McClellan is fairly straight in plan-form with channel geometry strongly influenced by a steep left bank (northwest) roughly 35 feet in height. Unlike Steep Chestnut and BH-3 Chestnut, the banks adjacent to Steep McClellan do not appear to have experienced increased soil loss. As with Steep Chestnut, the channel bed at Steep McClellan is fairly well organized with a clear riffle-pool sequence moving downstream.

2.3.4 McClellan Ranch critical riffle

The McClellan Ranch critical riffle has an average width of 19.8 feet, is roughly 43 feet in length and has a bed slope of 3.6 percent. The right bank has experienced heavy soil loss and is mostly devoid of vegetation. Heavy soil loss is probably due in part to foot traffic associated with the McClellan Ranch Trail and a decrease in sediment load to Stevens Creek located downstream of Stevens Creek Dam. The left bank, on the other hand, appears to be fairly stable, with stability provided by two large sycamores (*p. racemosa*) and a variety of riparian species. The channel bed through this reach is very disorganized and includes several boulder-sized fragments of rip-rap. During three visits to this critical riffle, small dams built with rip-rap and naturally occurring sediment clasts were observed. The downstream end of this critical riffle is considerably narrower than the upstream end with a steeper right bank that is largely built of boulder sized rip-rap. This abrupt change in geometry and channel bank make-up has caused the toe of the McClellan Ranch critical riffle to steepen. Due to the anthropogenic influences at the McClellan Ranch critical riffle, the channel bed is fairly disorganized although pool and riffle structure is clear.

2.3.5 Homestead Road critical riffle

The Homestead Road critical riffle is located at the upstream end of a slight west-trending meander in Stevens Creek. This critical riffle has an average width of 21.2 feet, is roughly 51 feet in length and has a bed slope of 2.2 percent. The outside bank (right bank) of the meander (and critical riffle) has undergone extensive stabilization in the recent past with a combination of boulders and root wads in an effort to protect an adjacent apartment complex. The stabilization of the right bank has resulted in the addition of rip-rap material to the channel at this location. The Homestead Road critical riffle is characterized by flow dynamics and related effects similar to those discussed for Steep Chestnut; flow is concentrated towards the right bank however, soil loss is not currently a problem due to the stabilization efforts. The left bank is fairly stable with abundant riparian vegetation and no signs of increased loss of soil.

2.3.6 Fremont Road critical riffle

The Fremont Road critical riffles has the most complex geometry of the Stevens Creek. The average riffle width was not measured due to the multiple thread channels present beneath the bridge crossing. The length of the critical riffle is roughly 200 feet and the left-channel has a bed slope of 1.0 percent. The bed material found through this reach is very well sorted, consisting of coarse to very coarse pebble-sized sediment. (16 to 64 millimeters). Beneath the bridge crossing the stream has built two channel threads with the right thread located roughly 4.0 feet lower in elevation than the left thread. Downstream of the bridge crossing, riffle geometry is wide and flat before narrowing substantially to roughly 6.0 feet in width and changing to pool morphology. It is presently unclear why the stream has built two very distinct channel threads at this location.

2.4 Physical characteristics of the Coyote Creek critical riffles

A summary of characteristics for the Coyote Creek critical riffles is given in Table 2 with photographs of Coyote 3 and 5 critical riffles presented in Figures 10 and 11. The Coyote Creek critical riffles range in length from 81 feet for Coyote 5 to 112 feet for Coyote 1 and Coyote 4. The width of critical riffles on Coyote Creek range from 20 feet for Coyote 2 to 38 feet for Coyote 3. Low-flow critical riffle slopes range from 1.0 percent for Coyote 1 to 2.6 percent for Coyote 4. Visual estimates of the 50th percentile grain size of channel bed material for each critical riffle on Coyote Creek range from coarse pebbles to small cobbles (16 to 128 millimeters). Estimated embeddedness of bed material at each critical riffle was minor and ranged from 5 percent to 20 percent. Estimates of embeddedness on Stevens Creek ranged from 10 percent to 40 percent.

2.4.1 Coyote 1 critical riffle

Coyote 1 is a wide, flat riffle that is bordered on the left bank (southern) by a small floodplain. The average riffle width is 29.3 feet, it is 111 feet in length and has a bed slope of 1.0 percent. A deciduous tree marks the top of the riffle and there is an accumulation of large sediment grains oriented perpendicular to the direction of flow which, at the time of measurements, resulted in a standing wave. Beyond the small floodplain bordering the left bank, the channel is confined by a steep bank which is roughly twenty feet in height. A floodplain is found along the right bank of Coyote 1 at a height of about 3 feet above the channel bed. This floodplain extends to the north for about 100 feet. During times or large release from the reservoir, the stream may occupy a secondary channel located roughly 100 feet to the north of the right bank discussed above.

2.4.2 Coyote 2 critical riffle

Coyote 2 critical riffle can be characterized as a very poorly organized riffle with two distinct channel threads similar to those discussed for the Fremont Road critical riffle on Stevens Creek. The right channel thread at Coyote 2 is located roughly 4.0 feet lower in elevation than the left channel thread with four small channels connecting the two threads at various points along the longitudinal profile. An average riffle width was not calculated for Coyote 2 because of the multiple channels; the length of riffle is 92 feet and the right-channel has a bed slope of 2.3 percent. At the time of survey, the right channel was capturing roughly 80 percent of the streamflow. As with Coyote 1, the left bank adjacent to Coyote 2 is very steep and roughly 20 feet in height. The right bank is also similar to that discussed for Coyote 1, a floodplain is found at an average height of 3.0 feet above the channel bed and extends to the north at this height for about 100 feet. The downstream end of Coyote 2 resembles a chute as the riffle width narrows slightly and bed slope increases.

2.4.3 Coyote 3 critical riffle

Coyote 3 critical riffle is the most organized and stable riffle measured and modeled for Coyote Creek. It is a wide, moderately flat riffle with abundant California bays (*Umbellularia californica*), valley oaks (*Quercus lobata*), shrubs and grasses bordering the channel. Bi-valve shells were also observed in large numbers on the banks and bed of the stream. The average riffle width at Coyote 3 is 38.8 feet, the riffle is 101 feet in length and it has a bed slope of 1.5 percent. Along the left bank, an expansive floodplain exists at a height of roughly 4.0 feet above the channel-bed. The channel is bordered on the right by a very steep slope that is roughly 100 feet in height. A small floodplain does exist along this bank at the midpoint of the riffle (along the longitudinal length of the riffle) roughly 3 feet above the channel bed. The pools above and below the riffle are very well developed and, as stated above, the riffle is well organized and has a fairly uniform cross-stream geometry.

2.4.4 Coyote 4 critical riffle

Coyote 4 critical riffle has an average width of 34.5 feet, is 112 feet in length and has a bed slope of 2.6 percent. This riffle is built within large alluvial deposits just upstream of a Santa Clara Valley Water District percolation pond and thus has the appearance of a channel located on an outwash plain. The riffle changes, in a downstream progression, from a wide, flat riffle built from well sorted bed material to a steep, oblique riffle that ends in a deep pool. At the upstream end of the riffle, the channel is bordered on the left bank by a nearly vertical wall of alluvial sediment roughly 10 feet in height. Below this wall exists a floodplain littered with pebble and cobble sized material. The channel is bordered on the right bank by a floodplain that is situated approximately 3.0 feet above the bed of the channel and supports riparian vegetation such as willows (*Salix spp.*) and grasses.

2.4.5 Coyote 5 critical riffle

Coyote 5 critical riffle is very similar, geometrically, to the Fremont Road critical riffle discussed above for Stevens Creek. Coyote 5 has an average width of 21.8 feet, is 81 feet in length and has a bed slope of 2.0 percent. Coyote 5 critical riffle is located beneath the Tully Road Bridge where the channel has split due to the presence of a mid-channel pier. At the time of survey, the west-channel was capturing 95 percent of flow while the east-channel, located on the other side of the bridge pier, appeared to be primarily a high flow secondary channel capturing roughly 5 percent of flow during low-flow periods. The riffle at Tully Road is composed of very well-sorted coarse to very-coarse pebble (16 to 64 millimeters) sized material. The downstream end of the riffle resembles a chute as the width narrows and bed slope increases, similar to the structure observed at Coyote 2.

3. HYDRAULIC MODELING AND PASSAGE FLOW ESTIMATION

One of the objectives of this study was to investigate the potential of using conventional hydraulic modeling software to estimate passage flows in the subject streams. The detailed field data collected for each of the riffles provides an excellent basis for calibrating and/or assessing the applicability of such models to passage flow estimation.

3.1 Calibration discharge measurements

Copies of discharge field forms for Stevens and Coyote Creeks are given in Appendix C with a summary of discharge measurements taken on both creeks given in Tables 1 and 2, respectively. As discussed in Section 1.2, a total of eight discharge measurements were taken on Stevens Creek and a total of four on Coyote Creek. Average water velocities at the time of measurement were measured according to the standard 0.6-depth and surface-velocity methods (USGS Water Supply Paper 2175, Volume 1, 1982). Discharge was then computed for n observation verticals along the measurement cross-section in the following manner:

$$\text{Discharge (Q, in cfs)} = \sum (V_n * A_n),\ n = 1,2,3,4\ldots n \qquad (1)$$

Where V represents the average water velocity at the nth observation vertical and A represents the cross-sectional area of the nth observation vertical.

As discussed in Section 2.1, all riffles measured on Stevens Creek are located downstream of Stevens Creek Reservoir and all riffles measured on Coyote Creek are located downstream of Anderson Lake. Six of the eight discharge measurements on Stevens Creek were taken during conditions analogous to that of winter base-flow. These six streamflows range from 2.2 to 4.7 cfs[10]. Two additional discharge measurements were taken at the McClellan Ranch critical riffle during rainstorms on January 10, 2001, and February 24, 2001, with discharge measured at 13.3 and 22.2 cfs, respectively. The range of streamflows measured on Coyote Creek during our initial field visits was 13.7 to 25.5 cfs. No additional discharge measurements were made on Coyote Creek since one vertical through each cross-section was at or near the minimum passage depth of 0.8 feet during the primary field survey.

3.2 Model calibration issues

Water surface elevations measured at the time of level-survey work were used in conjunction with the corresponding measured discharge in an attempt to calibrate a conventional hydraulic model package to simulate the observed depths and discharge. The software selected was the U.S. Army Corps of Engineers' HEC-RAS model (the updated version of the HEC-2 model). It was recognized at the outset of this project that HEC-RAS would have limited potential for modeling the complexities of the riffle structures, since it is a one-dimensional steady-state model package. However, the data overhead involved with multidimensional models at the scales needed to identify fish passage was deemed prohibitive.[11]

HEC-RAS models were set up for each of the riffles on both streams. Attempts to calibrate the models to the observed water surface elevations on a cross-section by cross-section basis proved unsuccessful (first round of modeling). If the model output yielded a water surface elevation for one cross-section that matched the observed average water surface elevation for that section, then the output for the other cross-sections in the riffle were generally markedly different than the field observations. This was particularly evident with the Stevens Creek riffles that were initially measured under winter base flow conditions where the influence of individual riffle elements almost certainly plays a major role.

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[10] "cfs" refers to cubic feet per second: the English unit of volumetric flow rate.

[11] Some of the primary limitations in this regard are the more complex boundary conditions that would need to be identified and calibrated concurrently with the need for even more detailed geometric data for large cobbles and other elements of the riffle structure.

Results from the first round of modeling illustrated the importance of back-calculating or estimating the Manning's 'n' value for each riffle rather than varying 'n' to calibrate the hydraulic models[12]. Calibration runs yielded 'n' values much higher than those typically employed in routine channel modeling. It is important to note that Manning's 'n' describes roughness attributed to elements of the channel bed, the channel banks, riparian vegetation and channel form in plan space. Manning's 'n' was developed to describe the various components of roughness during streamflows of at least bankfull magnitude. At streamflows below bankfull, Manning's 'n' does not fully account for energy loss due to elements of the channel bed or banks. This is due primarily to energy loss in the form of flow regime transitions from supercritical to sub-critical (or vice versa) as water moves over the larger elements on the channel bed. For a more detailed discussion of this topic please refer to Coon, 1998 and Hecht and Owens, 1996.

Another factor that is manifest in the HEC-RAS modeling is the aforementioned multi-dimensional character of the flow patterns (Section 3.2). For example, the water surface elevations at points within each riffle cross-section varied, sometimes markedly (on the order of 0.2 feet or more). The HEC models yield only one water surface elevation at each cross-section. In essence, the models give a depth referenced to an "average" water surface elevation. This is an important point if migrating fish find passage based on the actual depth at any point and not average depth, as seems reasonable.

3.3 Methods of modeling passage discharge

While detailed hydraulic model calibration was shown to be untenable, the problem of estimating passage discharge still remained. This led to the identification of two potential methods of passage flow estimation that did not rely on point-by-point calibration. Each of these methods was evaluated in light of the field data collected as described below.

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[12] The calibration process also included varying the contraction/expansion coefficients. It was quickly realized, however that a multi-parameterized calibration process would, at best, lead to results with limited applicability to other riffles or streams.

Perhaps the most important aspect common to these methods is that they are based on the definition of a single riffle parameter that we have called "controlling depth". Controlling depth is defined as the minimum of the maximum water depths observed through the cross-sections of each critical riffle. This does not include cross-sections located in the pools above or below the critical riffles. For nine of the 11 critical riffles, three cross-sections were measured within the actual riffle structure. The maximum depth measured for each cross-section is then tabulated and the controlling depth is set at the minimum of these maximum depths. For example, if maximum water depths of 0.53, 0.62 and 0.49 feet were measured through three cross- sections at a critical riffle, the controlling water depth would be 0.49 feet. The concept of controlling depth stems from the fundamental assumption that if a fish can pass through the most restrictive cross-section, it will be able to successfully navigate the entire riffle.

3.3.1 Estimation using HEC-RAS models and model-generated Manning's 'n' (Method 1)

The first method investigated entailed simply calibrating the HEC-RAS models for each riffle to the controlling depth rather than on a point by point basis as described in Section 3.2. For each riffle, models runs were carried out iteratively using a single 'n' value for all cross-sections until the model output gave a controlling depth that matched that measured in the field. This model generated 'n' value was then fixed for further runs where the discharge was varied until the model output gave a controlling depth of 0.8 feet, the fish passage criterion. This method was identified as a potential approach since it has the advantage of using a calibrated model without the need for extensive multi-parametric fits to field data. The fundamental assumption is that although a one-dimensional steady-state model cannot capture the nuances of the hydraulics on a point by point basis, it can still be internally consistent with respect to an overall parameter such as controlling depth.

This method was applied to each riffle that was measured during discharges above winter baseflow. Coyotes 1 through 5, McClellan Ranch and Steep McClellan critical riffles had sufficient data at appropriate flow rates for use in this modeling approach (discharge of 13.3 to 25.5 cfs, see Tables 3 and 4).

3.3.2 Estimation using manual calculations and field-based Manning's 'n' (Method 2)

The second method investigated was formulated in an effort to identify an approach that does not require the time and effort of setting up a hydraulic model for each riffle. The objective was to evaluate a method of passage flow estimation based on field measurements and manual calculations only. This method proposed involved calculating an average riffle 'n' value based on the field measurements of discharge, average water velocity and corresponding flow dimensions through each riffle (i.e. flow depth and width). Average water velocity was calculated from measured discharge and the average cross sectional area of flow for each critical riffle. One difference from more traditional derivations of Manning's 'n' is that the average riffle 'n' value was calculated using average water depth at each cross section rather than the hydraulic radius[13].

Once the field 'n' value was calculated, new calculations were carried out using this 'n' to estimate the discharge required to meet the passage depth criterion of 0.8 feet. These calculations were initiated by increasing or decreasing the controlling depth at a riffle until the passage depth criterion was met. This increase or decrease in controlling depth was then added or subtracted to the other cross-section locations in the riffle[14]. Passage discharge was then calculated with the adjusted water depths (average riffle water depth), the adjusted cross sectional area of flow, riffle slope and the field calculated 'n' value.

All critical riffles investigated were included in Method 2 estimations of passage flow, including those riffles measured during winter baseflow. The decision to include the winter baseflow data in Method 2 stemmed from an interest in how far this approach could be reasonably extrapolated when the controlling depth at the time of measurement varied substantially from the passage criterion of 0.8 feet.

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[13] Manning's 'n' = (1.49 / average velocity) * ($R^{0.67}$) * ($S^{0.5}$). In our approach (and the approach used by Wolman, 1955, and Judd , 1963) hydraulic radius (R) is replaced by average water depth.

[14] For example, if a critical riffle had a controlling water depth of 0.70 feet, 0.10 feet was added to each observed water depth throughout the riffle cross-sections. Then the new average depths were used with the previously derived 'n' value to estimate the equivalent discharge.

3.3.3 Other potential methods of estimating passage discharge

The two methods outlined above are by no means the only potential approaches to estimating passage flow, but were selected as providing one model-based and one purely field-based approach.

Consideration was also given to the use of the HEC-RAS models that were calibrated to observed controlling depths and run with the field-based 'n' values. Passage flow estimates garnered from this approach varied widely from the other two methods, which proved to be in quite close agreement (see Sections 3.4 and 4.0). This result is not surprising since it is tantamount to using an uncalibrated hydraulic model to represent the complex flow behavior of the riffles.

3.4 Results for Stevens Creek

Table 3 highlights the results of applying the two methods discussed above to the problem of passage flow estimation for the Stevens Creek critical riffles. Several important observations can be made based on these results:

- *Passage discharge estimates using Methods 1 and 2.* Results given in Table 3 show a tight range of passage discharges predicted by both Methods 1 and 2 for Steep McClellan and McClellan Ranch critical riffles. However, Method 1 predicts a higher passage discharge (much above the tight range of the other values) for the January 10th event at McClellan Ranch due to the smaller value of the calibrated roughness ('n'). For the same event at McClellan Ranch, Method 2 yields a passage discharge value within the range discussed above. This is attributable to the similarity between the calculated roughness for this event and the other two events modeled (0.115, 0.075 and 0.111 respectively). Except for the January 10th event under Method 1, results range from a low of 17.3 cfs at McClellan Ranch to a high of 20.0 cfs at Steep McClellan and McClellan Ranch critical riffles. The mean passage discharge for the three events modeled at Steep McClellan and McClellan Ranch critical riffles is 22.3 cfs for Method 1 and 18.7 cfs for Method 2.

Table 3 also includes the predicted passage flows for the other four Stevens Creek riffles using Method 2. All these riffles were surveyed and measured under winter baseflow conditions where the controlling depth was well below 0.8 feet. Except for the Fremont Road riffle, the field-estimated 'n' values under these conditions are markedly higher than those found nearer to passage depth conditions. If extrapolated using Method 2, the high roughness estimates lead to predicted passage discharges that we feel are not realistic or in agreement with the field observations (see the discussion in Section 4.0).

- *Measured passage discharges.* The discharge measurement taken at Steep McClellan and McClellan Ranch critical riffles on February 24th, 2001 provided depth conditions which met or exceeded the passage depth criteria. These discharges were measured as 20.0 and 22.2 cfs respectively (Table 3).[15] The controlling depth observed during the measurements was 0.80 and 0.85 feet, respectively. *It is important to note that* the predicted passage discharges (from both Methods 1 and 2) for the McClellan Ranch riffle are only slightly lower than the measured discharge of February 24th, 2001 (which yielded passage conditions). This result is to be expected and supports the applicability of Methods 1 and 2, at least when the supporting field survey work is completed during flows that are close to meeting passage criterion. Of course, by definition, both methods predicted passage flows that are close to the measured flow of February 24th, 2001 because the field measurements used to internally calibrate each method were taken when the controlling depth slightly higher than the passage depth criterion (0.80 feet).

3.5 Results for Coyote Creek

Table 4 highlights the passage flow estimations for the Coyote Creek critical riffles using both estimation methods. Several important observations can be made based on these modeling:

- *Passage discharge estimates using Methods 1 and 2.* The results detailed in Table 4 show a very tight range of passage discharges predicted using both Methods 1 and 2 for all five critical riffles investigated on Coyote Creek. Even more so than the results for Stevens Creek, both suggested methods yield estimated passage flows that are in good agreement from riffle to riffle. This is especially important given the length of Coyote Creek represented by the five riffles. Results range from a low of 16.5 cfs at Coyote 5 (Method 1) to a high of 22.5 cfs at Coyote 1 (Method 1). The mean passage discharge for all five riffles for Method 1 is 19.2 cfs and for Method 2 is 19.0 cfs.

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[15] The value of 20.0 cfs measured at Steep McClellan represents an estimate based on surface velocity measurement and measured flow area through the riffle.

- *Measured passage discharges.* Due in part to timely rainfall just prior to level-survey work, the controlling depths measured at Coyote 1, 2 and 3 were found to exceed 0.80 feet. The measured discharge at Coyote 1 and 2 was 25.5 cfs, while that at Coyote 3 was 24.6 cfs. For these discharge measurements, the observed controlling depths were 0.87, 0.89 and 0.91 feet, respectively. The depths measured at Coyote 4 and 5 did not quite meet the passage criteria. However, at Coyote 4 the controlling depth was only somewhat below 0.80 feet (0.73 feet), and at Coyote 5 the controlling depth was 0.71 feet. Since all riffles were measured at flows that yielded controlling depths relatively close to the passage criterion, we have a high level of confidence in the agreement between the estimations of Methods 1 and 2 and the actual measured flows.

The results summarized in Table 4 suggest a trend toward lower passage discharge moving downstream toward Tully Road. However, there is not enough data overall to clarify whether this is the result of actual physical conditions.

4. DISCUSSION OF THE RESULTS

4.1 Channel Roughness and Flow Depth

Several researchers (Wolman, 1955; Judd, 1963) have demonstrated that roughness (resistance to flow; represented by Manning's 'n') increases as discharge (and, consequently, flow depth) decreases. This result is generally viewed as being expected due to the increased effect of larger bed elements on flow resistance as flow depth approaches the height of these elements (height above the bed elevation). It is important to note that 'n' is dependent on a number of variables including relative position in a watershed, bedform configuration, size distribution of surficial bed sediment, vegetation present on banks and adjacent floodplain and the suspended sediment concentration at the time of flow measurement (Wolman, 1955). Understanding the relationship between channel roughness and flow depth has many potential applications for habitat managers. Foremost of these would be the ability to estimate passage flows for migrating salmonids from basic field techniques and calculations only (that is, without the need to set-up and run hydraulic engineering software).

In light of this, the 'n' values measured in the field for the Stevens and Coyote Creeks riffles should be viewed in the context of other sites reported in the literature. Perhaps the best source of data for such a comparison are those collected and published by Judd (1963). Appendix D illustrates Judd's (1963) data of Manning's 'n' verses flow depth for thirteen sites along five gravel-bedded streams in southern Idaho and northern Utah.[16] Additionally, the calculated 'n' values for Stevens and Coyote Creeks have been added to Judd's plot for easy comparison. Three observations are readily evident from this plot:

- There is a range of scatter for the calculated 'n' values at any given flow depth. This is not surprising given the complexity and variation among riffle structures.

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[16] Judd's original plot included data points taken from work published by Boyer in 1954. The latter work focused on calculating Manning's 'n' values as depths much greater than the passage criterion used in this study.

- Manning's 'n' is clearly a function of the depth of flow (and discharge) with a marked increase in 'n' with decreasing depth.

- Data collected on Stevens and Coyote Creeks fit reasonably well within the range of values observed by Judd and Boyer and follow the trend (at the upper end of 'n' values calculated) described by the regression through their data. This is of particular interest since the data collected in this study extend the range of the plot significantly with regard towards lower depths. This is especially important given that the roughness values calculated from our data at passage depth are generally much higher than those applied to typical modeling of open channel flow. Therefore, applying generally accepted Manning's 'n' values[17] to passage flow estimation would lead to very large overestimates of the discharge needed to meet the passage depth criterion.

4.2 Relationship between Discharge and Maximum Water Depth

The characteristics of open-channel flow have been the topic of research in engineering and geologic circles for centuries. However, advances made in open-channel flow research have only limited application to passage discharge estimation due to the fairly focused scope of past and current efforts that have not investigated the relationship of flow depth and discharge through natural bed features[18]. A literature search was conducted to locate journal articles describing research focused on this particular topic. Four articles were found with only one article having direct application to this project.

Mosley (1982) investigated the discharge needed to reach specified depths at riffles and points of divergence on three braided streams near Canterbury, New Zealand. We were able to evaluate data collected for McClellan Ranch and Steep McClellan critical riffles in a similar manner as that conducted by Mosley (Figures 12 and 13). As discharge increases, maximum water depth across the McClellan Ranch and Steep McClellan critical riffles increases, as is to be expected. However, what is interesting is the similarity of the relationships between riffles found on Stevens Creek and similar bed forms found in the New Zealand streams. Figures 12 and 13 illustrate the relationship between measured streamflow and the maximum water depth measured at each cross-section for the McClellan Ranch and Steep McClellan critical riffles, respectively. These were the only two cross-sections from Stevens or Coyote Creeks to have sufficient data for conducting the Mosley (1982) analysis. At McClellan Ranch, best-fit log relationships to data for cross-sections 6, 7 and 8 have slopes very similar to that for the New Zealand data. At Steep McClellan, the best-fit log relationship to data for cross-section 9 has a slope very similar to that for the New Zealand data. Mosley (1982) suggests that riffles of differing geometries behave in a similar fashion as discharge increases; data collected on Stevens Creek provides some validity to Mosley's theory. This is not conclusive evidence, however but it does hint at a fundamental hydraulic principle, yet to be identified, that can describe riffles in very different parts of the world[19].

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[17] For Stevens and Coyote Creeks, typical 'n' values for modeling of flood flows, bridge scour, etc. would likely be on the order of 0.04 to 0.06.

[18] Past and current efforts have focused on describing relationships between discharge and channel hydraulic geometry dimensions such as width, depth and velocity. More recent efforts have also focused on working out the mathematics that describe multi-dimensional flow. Additional variables such as sediment moving as bedload and suspended load introduce additional difficulties to the problem.

4.3 Empirical Relationship between Discharge and Passage Depth

An additional, and potentially important, relationship was found when controlling depth was plotted as a function of measured discharge (see Figure 14). The data points, although limited in number, provide a surprisingly good fit, especially considering that the data were generated on two separate Santa Clara Valley streams. The best linear regression fit to the data give a passage discharge estimate of just over 20 cfs for the critical riffles investigated. More data are needed to investigate the implied relationship more closely. At this stage, it appears that the data in Figure 14 point to an underlying hydraulic relationship which describes flow through riffle bed forms, at least in the two streams investigated.

Several additional observations should be made regarding Figure 14:

- There is significantly more scatter of data at low flows (< 5 cfs) than flows above 13 cfs. Again, this result is probably related to the fact that individual roughness elements on the bed have an increased effect on localized flow depths at low flows.

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[19] It is important to note that data applied to the New Zealand model for McClellan Ranch and Steep McClellan critical riffles consist of only a few (three and two measurements only). These are too few data points to address statistical significance. The discussion and exercise was completed for overall interpretive reasons only and to very coarsely compare our data with data collected elsewhere.

As discharge increases, the impact of smaller roughness elements are likely drowned out by the overall hydraulics of the riffle.

- Although Figure 14 implies a generally linear relationship between discharge and controlling depth, the relationship is far from one to one. The field measurements from Stevens Creek found controlling depths on the order of 0.5 feet at discharges below 5.0 cfs. However, Figure 14 would indicate that increasing the controlling depth by 0.3 feet to meet the passage criterion would require a four-fold increase in stream flow.

4.4 Methods of Estimating Passage Discharge

Since it is unlikely that riffle surveys can be carried out at exactly passage depth, even under controlled conditions, there is considerable advantage in identifying methods to extrapolate field data to estimate passage discharge. One readily apparent approach would be to create rating curves for each riffle relating controlling depth to discharge, similar to Figure 14. In fact, since it relies on actual measurements of depth and discharge, this remains the most reliable means of assessing passage flow requirements. However, this approach would require at least two, and preferably four or more, measurements at distinct flows bracketing the actual passage discharge to give reliable results. This makes a rapid assessment of passage flow requirements difficult, especially outside of California's limited rainy season.[20]

Recognizing the limitations of using rating curves for individual riffles, this report presents two possible methods of estimating passage flows for salmonids based on more limited data. Method 1 utilizes the HEC-RAS modeling, while Method 2 is based on manual calculations (see Sections 3.3.1 and 3.3.2). Each method is internally consistent in that single data points are extrapolated to passage flow conditions using either model-generated or field-based 'n' values. Both methods yield results that are quite consistent with the overall field measurements as summarized in Figure 14. Read off Figure 14, passage flow would be estimated for the riffles investigated as 20.0 cfs. Methods 1 and 2 yield average passage flows of 22.3 and 18.7 cfs for Stevens Creek[21], respectively. For Coyote Creek, Methods 1 and 2 give average passage flows of 19.2 and 19.0 cfs, respectively.

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[20] A notable exception to this limitation would exist on streams where flow is regulated by an upstream dam, as long as controlled releases are physically or economically feasible. Of course, the limitations inherent in the use of rating curves are not avoidable on unregulated streams.

[21] Only includes estimates for Steep McClellan and McClellan Ranch critical riffles.

It is important to note the built-in limits inherent in Methods 1 and 2 as revealed by the field data. The primary limit concerns the magnitude to which field measurements can be extrapolated to estimate conditions at passage flow using the two methods. The discussion in Section 4.1 should clearly warn against extrapolation based on fixing an 'n' value at one flow to estimate conditions at a markedly different discharge since roughness is a strong function of depth and flow. However, the data collected on Stevens and Coyote Creeks indicate that the errors involved are likely relatively small as long as the controlling depth at the time of measurement is within 25 percent of the passage criterion (e.g. controlling depth between 0.6 and 1.0 feet). When we applied Method 2 to low flow measurements at all six Stevens Creek critical riffles, a much different set of results was derived for five of the riffles, results that are inconsistent with the overall data as plotted in Figure 14. For example, passage flow at Steep McClellan would be estimated as 7.6 cfs if the winter baseflow data had been used, whereas direct field measurement found the value to be at or near 20.0 cfs.

More data would need to be collected across a suite of flows to better define the accuracy and limits of extrapolation associated with the two methods. Nonetheless, it appears that both methods hold promise for creating a rapid assessment of passage flow. This is particularly true of Method 2, which presents a non-modeling method for estimating passage flows that can be readily reduced to a simple spreadsheet solution. Method 2 would also eliminate the need for the detailed survey data that are probably needed for any hydraulic modeling.

Similarly, it would be most helpful to collect fresh data at each riffles after major storms, so that the longer-term stability of the results may be accessed.

4.5 Controlling Riffle Type

It was initially theorized that different riffle geometries would likely be described by different passage discharges. An early hypothesis was that shorter, steeper riffles would need greater discharges to meet the passage criterion than wider, flatter riffles. In fact, the set of riffles on Stevens Creek was chosen to include these different riffle geometries.

We chose a broad range of riffle geometries in an attempt to capture differences that might exist between them.

Unfortunately, the limitations in extrapolating from winter baseflow to passage depth preclude any conclusions in this regard at present. However, it is intriguing that the final best estimate of passage flow for the Steep McClellan riffle (short, steep type) and the McClellan Ranch riffle (wide, flat type) are almost identical. The estimates of passage flow on Coyote Creek are more extensive and internally consistent, but this stream does not show such a wide variation in riffle geometry.

5. CONCLUSIONS AND RECOMMEDNATIONS

5.1 Conclusions

Several conclusions follow directly from the fieldwork and subsequent analyses of the data collected on Stevens and Coyote Creeks.

1. *Suitability of HEC-RAS for detailed modeling of riffle hydraulics.* This project collected ample input data on riffle geometry, flow depth and discharge for detailed HEC-RAS modeling. However, efforts to calibrate HEC-RAS models on a cross-section by cross-section basis proved unsuccessful. This result is not unexpected, as HEC-RAS is a one-dimensional hydraulic model that was never intended to capture the specific complexities of multi-dimensional flow that characterizes the riffles.

2. *Estimation of passage discharge using HEC-RAS (Method 1).* Although HEC-RAS was not developed for modeling the specific details of riffle hydraulics, it was shown to provide reasonable potential results extrapolating to passage depth (0.8 feet) when it is calibrated (using Manning's 'n') to the measured controlling depth. This approach was termed Method 1. The data show that Method 1 provides a promising level of consistency when applied over a range of riffles (see, for example, the data from Coyote Creek).

3. *Estimation of passage discharge using manual calculations (Method 2).* Due to the overhead of survey and modeling efforts involved in Method 1, an alternative estimation approach using only manual calculations was investigated. Designated as Method 2, this approach involves the use of a back-calculated field 'n' value with observed average flow dimensions and riffle slope. The extrapolations using Method 2 were in close agreement with Method 1 and were consistent on an overall basis. This method is amenable to simple spreadsheet manipulation and would require as few as three surveyed cross-sections per riffle.

4. *Limits on extrapolation using the two methods.* Our data suggests that Methods 1 and 2 can be applied if the field data is collected when the controlling depth is within ±25 percent of the passage depth criterion of 0.8 feet. Therefore, observed

controlling water depths must be between 0.6 and 1.0 feet. However, it is important to note that streamflow conditions were not conducive to testing the outer limits of this extrapolation range. The field data conclusively demonstrate that extrapolation from controlling depths of less than 0.6 feet by either method are almost certain to yield misleading estimates of passage discharge. The data support the contention that the passage discharge would be consistently underestimated if Methods 1 or 2 are applied when the controlling depth is less than 0.6 feet.

5. ***Passage discharge on Stevens Creek*[22].** Although a total of six critical riffles from the Chestnut Picnic Area downstream to Fremont Road were surveyed in detail on Stevens Creek, four of the sites were only investigated under winter baseflow conditions. Thus, the field data for these four riffles (Steep Chestnut, BH-3, Homestead Road and Fremont Road) were outside the extrapolation range identified in this study. However, there is a high level of confidence that the passage discharge for the other two riffles, Steep McClellan and McClellan Ranch, is on the order of 20 cfs. In this case, Method 2 appears to provide a more reliable extrapolation of the field data for the McClellan Ranch riffle. Absent data collected under conditions closer to passage depth, there was no field evidence to suggest that other riffles would have passage discharge values markedly different from 20 cfs. These results do not account for additional barriers or passage impediments that may exist below or in between sites.

6. ***Passage discharge on Coyote Creek*[21].** A total of five critical riffles were surveyed in detail on Coyote Creek from Anderson Dam County Park downstream to Tully Road. There is a high level of confidence that the average passage discharge within this segment of Coyote Creek is on the order of 19 cfs. In this case, both Methods 1 and 2 give a narrow range of passage discharge on a riffle by riffle basis. This may reflect the fact that all five riffles were surveyed under conditions where the controlling depth was close to 0.8 feet. The results suggest a trend to lower passage discharge in a downstream direction, but there are insufficient data to verify whether this is actually the case.

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[22] This does not address the discharge needed for passage over possible barriers or through other critical areas downstream, upstream or in between the critical areas modeled in our project.

7. *Ultimate measure of passage flow requires rating curves.* Riffles are geometrically complex and dynamic bedforms that can and do vary in structure from stream to stream and from site to site within the same stream. Previous publications (Wolman, 1955; Judd, 1963) and this project have collected data that illustrate the variability between 'n' and average flow depth and discharge. The results of this study indicate that both Methods 1 and 2 can be used to extrapolate field measurements to estimate passage discharge within an appropriate range. However, it is important to bear in mind that the complexities of natural riffle structures mean that the ultimate identification of passage discharge requires building site specific rating curves for each riffle that include a range of flows above and below that which meets the passage criterion. However, the overhead in gathering sufficient data to create such rating curves (especially on unregulated streams) suggests that the approximation techniques of Methods 1 and 2 can be valuable for rapid assessment of passage requirements.

8. *Manning's 'n' and variation of those values with depth.* The field data collected on both streams demonstrates that Manning's 'n' values associated with critical passage riffles vary significantly with depth. The values derived fit the trend of previous studies (Judd, 1963) and are generally markedly higher than the 'n' values used in open channel flow calculations or modeling. This is an important observation, since it shows that estimating passage discharge in the riffles studied using "conventional" 'n' values (e.g. 0.04 to 0.06) would grossly overestimate passage discharge requirements.

9. *Possible consistency in passage discharge between streams.* When the entire data set generated in this study is plotted with controlling depth as a function of stream discharge (Figure 14), the data suggest an underlying relationship that may apply equally well to both Stevens and Coyote Creeks. The trend line fit is surprisingly good and supports the contention that passage discharge will be on the order of 20 cfs for the two streams. The relationship breaks down at flows less than 5 cfs, most likely as a result of the increased effect of larger bed roughness at shallower flow. The data collected above 5 cfs, however, point to a potential underlying hydraulic principle exhibited by the investigated critical riffles. If this relationship is borne out for these two streams, it seems reasonable at this point that other streams in the Santa Clara Valley may also exhibit a similar relationship between controlling depth

and discharge. If widely applicable, data collection and passage flow estimation in the region could be greatly simplified while still providing valuable information to habitat managers working in the Santa Clara Valley.

5.2 Recommendations

The results and conclusions suggest a number of recommendations that can further refine the passage flow estimates presented here, refine the estimation methods and extend the results to other streams in the region. These recommendations include:

1. *Continued measurements on Stevens Creek.* Very extensive survey work, including benchmarking, has been completed on four Stevens Creek riffles where flow conditions have not yet been in the range that allows for reliable extrapolation to passage depths. It would be cost-effective to revisit these sites during higher flow conditions. This would allow for a more encompassing assessment of passage discharge for Stevens Creek. Additionally, the more heterogeneous character of the Stevens Creek riffles would provide a good test of the two estimation methods. If the passage discharge for these remaining four riffles is in line with the previous estimates, it would strongly suggest that there are geomorphic factors at work that lead to a regionally applicable passage discharge.

2. *Investigations on other streams.* The inter-stream consistency of passage discharge through natural bed features can best be measured by selecting riffles on streams other than Stevens and Coyote Creeks. At this point, the data suggest that as few as two sites on each additional stream should be measured. If these sites yield passage flow estimates on the order of the results presented here, more extensive survey work might well be considered unnecessary.

3. *Measurements following major storms.* Measurements should be repeated after major storms to access how constant passage flows might be, from year to year, and to further access the relative value of the two approaches.

6. LIMITATIONS

This report was prepared in general accordance with the accepted standard of practice existing in Northern California at the time the investigations were performed. No other warranties, expressed or implied, are made. It should be recognized that interpretation and evaluation of physical factors affecting habitat and passage conditions is a difficult and inexact art. Judgment leading to conclusions and recommendations are general made with an incomplete knowledge of the conditions present. More extensive studies, including additional streamflow-model calibration investigations (coordinated through scheduled releases) can reduce the inherent uncertainties associated with such studies. If the client wishes to reduce the uncertainty beyond the level associated with this study, Balance should be notified for additional consultation.

Balance Hydrologics has prepared this report for the client's exclusive use on this particular project. The report is based in part on work performed by experts in related fields, information provided by the client, and/or upon reference values commonly used in the area or developed by sources generally held to be reliable. We have not independently verified their validity, accuracy or representativeness to this or other sites. The recommendations provided in this report are based on the assumption that an appropriate and adequate follow-up program will be conducted, and that our firm will be retained at key stages in the project to revise the findings and recommendations described in this report.

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TABLES

Table 1. Summary of Critical Riffle Characteristics and Calibration Discharge Measurements, Stevens Creek, Santa Clara County

	Date of Fieldwork	Discharge Measured [1]	Reach Length	Riffle Length	Riffle Average Width [2]	Low-flow Riffle Slope [3]	Estimated Bed D-50 [4]	Estimated Embeddedness [4]
Riffle Name:		*cfs*	*feet*	*feet*	*feet*	*percent*		*percent*
Steep Chestnut	11/30/00	2.8	124.0	38.0	17.8	4.1	cobbles	10-20
BH3-Chestnut Picnic	11/20/00	4.7	219.0	44.0	24.0	3.9	cobbles	20
Steep McClellan	11/30/00	2.3	161.0	53.6	17.2	2.6	cobbles	10-20
McClellan Ranch	11/20/00	4.7	189.0	43.0	19.8	3.6	cobbles	30
McClellan Ranch	1/10/01	13.3	-	-	-	-	-	-
McClellan Ranch	2/24/01	22.2	-	-	-	-	-	-
Homestead Road	11/21/00	2.3	74.3	51.0	21.2	2.2	cobbles	20-30
Fremont Road	11/21/00	2.2	200.0	175.5	-	1.0	well-sorted very coarse pebbles	20-40

Notes: 1 Discharge measured by Balance Hydrologics staff at the time of riffle geometry measurements (level-survey)

2 Width of riffle was measured from base of channel bank on the left to base of channel bank on the right

3. Slope of water surface from crest of riffle to base of riffle at the time geometry measurements

4. Visual estimates

Table 2: Summary of Critical Riffle Characteristics and Calibration Discharge Measurements, Coyote Creek, Santa Clara County

	Date of Fieldwork	Discharge Measured (cfs)[1]	Reach Length (feet)	Riffle Length (feet)	Riffle Average Width (feet)[2]	Lo-flow Riffle Slope[3]	Estimated Bed D-50[4]	Estimated Embeddedness[4]
Riffle Name		*cfs*	*feet*	*feet*	*feet*	*percent*		*percent*
Coyote 1	1/17/01	25.5	234.0	111.0	29.3	1.0	coarse pebbles to small cobbles	5-15
Coyote 2	1/17/01	25.5	299.0	92.2	-	2.3	coarse pebbles to small cobbles	5-15
Coyote 3	1/18/01	24.6	310.0	101.0	38.8	1.5	coarse pebbles to small cobbles	5-15
Coyote 4	1/26/01	15.8	210.0	112.0	34.5	2.6	coarse pebbles to small cobbles	5-15
Coyote 5	1/26/01	13.7	187.0	81.0	21.8	2.0	coarse to very coarse pebbles	10-20

Notes: 1 Discharge measured by Balance Hydrologics staff at the time of riffle geometry measurements (level-survey)

2 Width of riffle was measured from base of channel bank on the left to base of channel bank on the right

3. Slope of water surface from crest of riffle to base of riffle at the time geometry measurements

4. Visual estimates

Table 3. Summary of Critical Riffle Hydraulic Modeling Results, Channel Roughness Values and Passage Flow Estimates, Stevens Creek, Santa Clara County

	Predicted Passage Discharge				Field Measured Passage Discharge					
	Method 1 predicted passage discharge (cfs)[1]	Method 1 reach calculated average Mannings 'n'[2]	Method 2 predicted passage discharge (cfs)	Method 2 reach calculated average Mannings 'n'	Date of Fieldwork	Discharge Measured[3]	Controlling Depth[5]	Reach calculated average mannings 'n'	Passage Criteria Meet at Measured Discharge?	Estimated Passage Discharge
Riffle Name:	*cfs*	-	*cfs*	-	-	*cfs*	*feet*	-	*yes / no*	*cfs*
Steep Chestnut	-	-	8.8	0.177	11/30/00	2.8	0.51	0.177	no	**20** [6]
BH3-Chestnut Picnic	-	-	7.8	0.183	11/20/00	4.7	0.62	0.183	no	**20** [6]
Steep McClellan	-	-	7.6	0.168	11/30/00	2.3	0.49	0.168	no	-
Steep McClellan	**20.0**	0.080	**20.0**	0.075	2/24/01	**20** [4]	**0.80**	0.075	**yes**	**20** [7]
McClellan Ranch	-	-	16.7	0.100	11/20/00	4.7	0.52	0.100	no	-
McClellan Ranch	***27.0***	*0.045*	***18.9***	0.115	1/10/01	13.3	0.58	0.115	no	**22.9** [7]
McClellan Ranch	**20.0**	0.080	**17.3**	0.111	2/24/01	**22.2**	**0.85**	0.111	**yes**	**18.7** [8]
Homestead Road	-	-	8.9	0.210	11/21/00	2.3	0.41	0.210	no	**20** [6]
Fremont Road	-	-	10.7	0.092	11/21/00	2.2	0.33	0.092	no	**20** [6]
Average:	22.3	0.068	18.7	0.100	Averages for Steep McClellan and McClellan Ranch only. Baseflow discharge measurements not included					

Notes:

1. The hydraulic model predicted passage discharge calculated with generally accepted Manning's 'n' values for similar streams at moderate flood stage.
   The predicted passage discharge was solved when a depth of 0.8 feet was predicted at one location along each cross-section at the six critical riffles.
2. Manning's 'n' used in calculating the hydraulic model passage discharge.
3. Discharge measured by Balance Hydrologics staff at the time of riffle geometry measurements (level-survey)
4. Discharge was estimated from surface velocity float tests and measurments of flow cross-sectional area through three monumented cross sections.
   Passage depth of 0.8 feet was met at all three cross-sections and flow was estimated twenty minutes after flow was measured at McClellan Ranch.
5. Controlling depth was defined in Section 3.3.1 of the report. Briefly, it is defined as the minimum of the maximum depths observed through the riffle cross sections at the time of discharge measurement.
6. Passsage discharge estimate based on the larger of the two estimates for Steep McClellan and McClellan Ranch. This estimate is conservative by nature and happens to agree with results illustrated in Figure 14.
7. Estimate deemd as too high based on conditions observed during discharge measurement of February 24th, 2001
8. Passage discharge estimate represents the mean value of the estimates given by methods 1 and 2 at each respective riffle location.

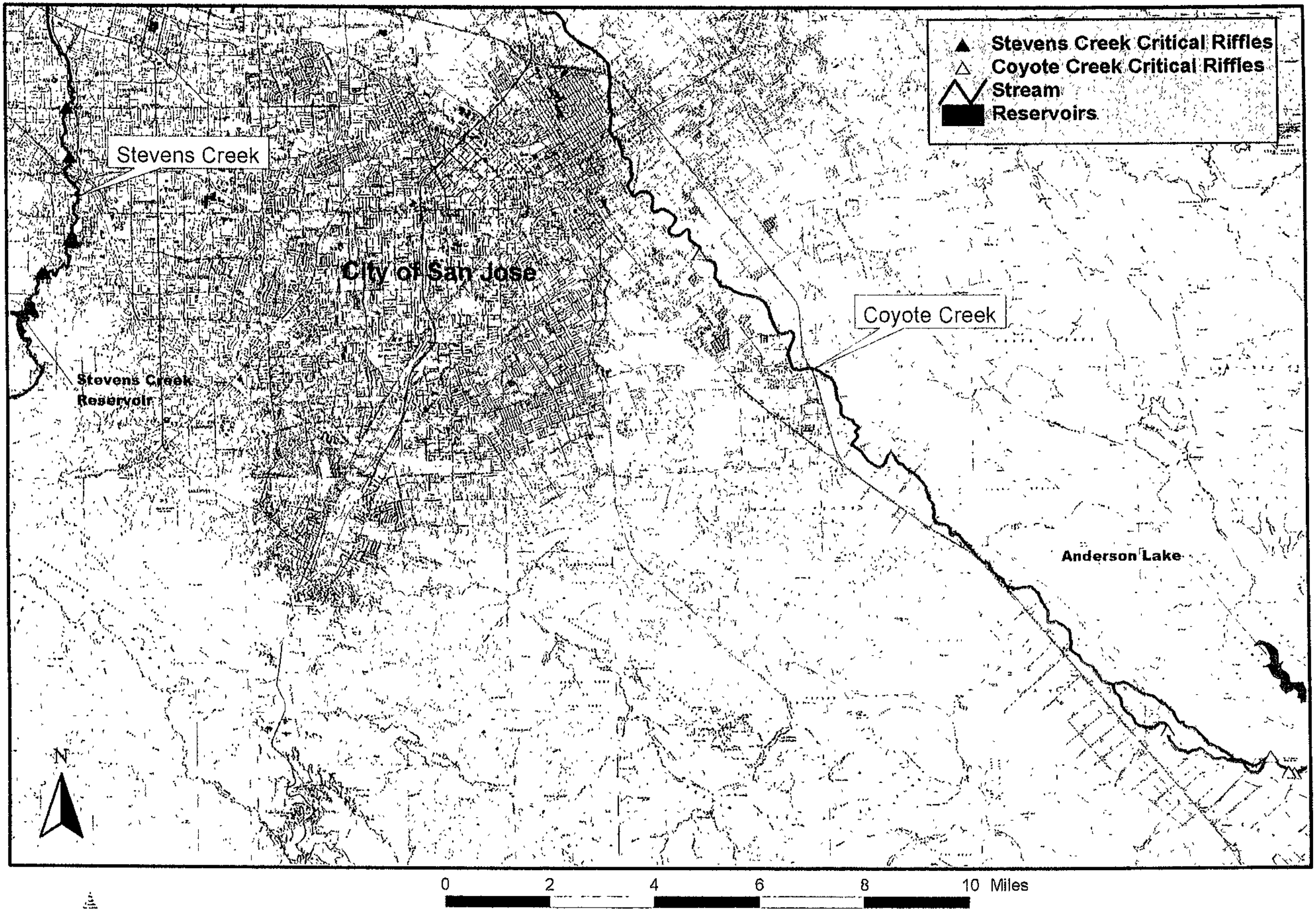
Table 4: Summary of Critical Riffle Hydraulic Modeling Results and Channel Roughness Values, Coyote Creek, Santa Clara County

	Predicted Passage Discharge				Field Measured Passage Discharge					
	Method 1 predicted passage discharge (cfs) [1]	Method 1 reach calculated average Mannings "n" [2]	Method 2predicted passage discharge (cfs)	Method 2 reach calculated average Mannings 'n'	Date of Fieldwork	Discharge Measured [3]	Controlling Depth [4]	Reach calculated average Mannings 'n'	Passage Criteria Meet at Measured Discharge?	Estimated Passage Discharge [5]
Riffle Name	*cfs*	-	*cfs*	-	-	*cfs*	*feet*	-	*yes / no*	*cfs*
Coyote 1	**22.5**	0.055	**20.7**	0.062	1/17/01	**25.5**	0.87	**0.062**	**yes**	**21.6**
Coyote 2	**20.0**	0.110	**21.3**	0.091	1/17/01	**25.5**	0.89	**0.091**	**yes**	**20.7**
Coyote 3	**17.5**	0.230	**16.9**	0.111	1/18/01	24.6	0.91	0.111	**yes**	**17.2**
Coyote 4	19.5	0.130	19.3	0.144	1/26/01	15.8	0.73	0.144	no	**19.4**
Coyote 5	16.5	0.115	16.9	0.102	1/26/01	13.7	0.71	0.102	no	**16.7**
Average:	19.2	0.128	19.0	0.102	Averages based on Coyote 1 through 5 critical riffles.					

Notes:

1. The hydraulic model predicted passage discharge calculated with generally accepted Manning's 'n' values for similar streams at moderate flood stage. The predicted passage discharge was solved when a depth of 0.8 feet was predicted at one location for each cross-section at the six critical riffles.
2. Manning's 'n' used in calculating the hydraulic model passage discharge.
3. Discharge measured by Balance Hydrologics staff at the time of riffle geometry measurements (level-survey).
4. Controlling depth was defined in Section 3.3.1 of the report. Briefly, it is defined as the minimum of the maximum depths observed through the riffle cross sections at the time of discharge measurement.
5. Passage discharge estimate represents the mean value of the estimates given by methods 1 and 2 at each respective riffle location.

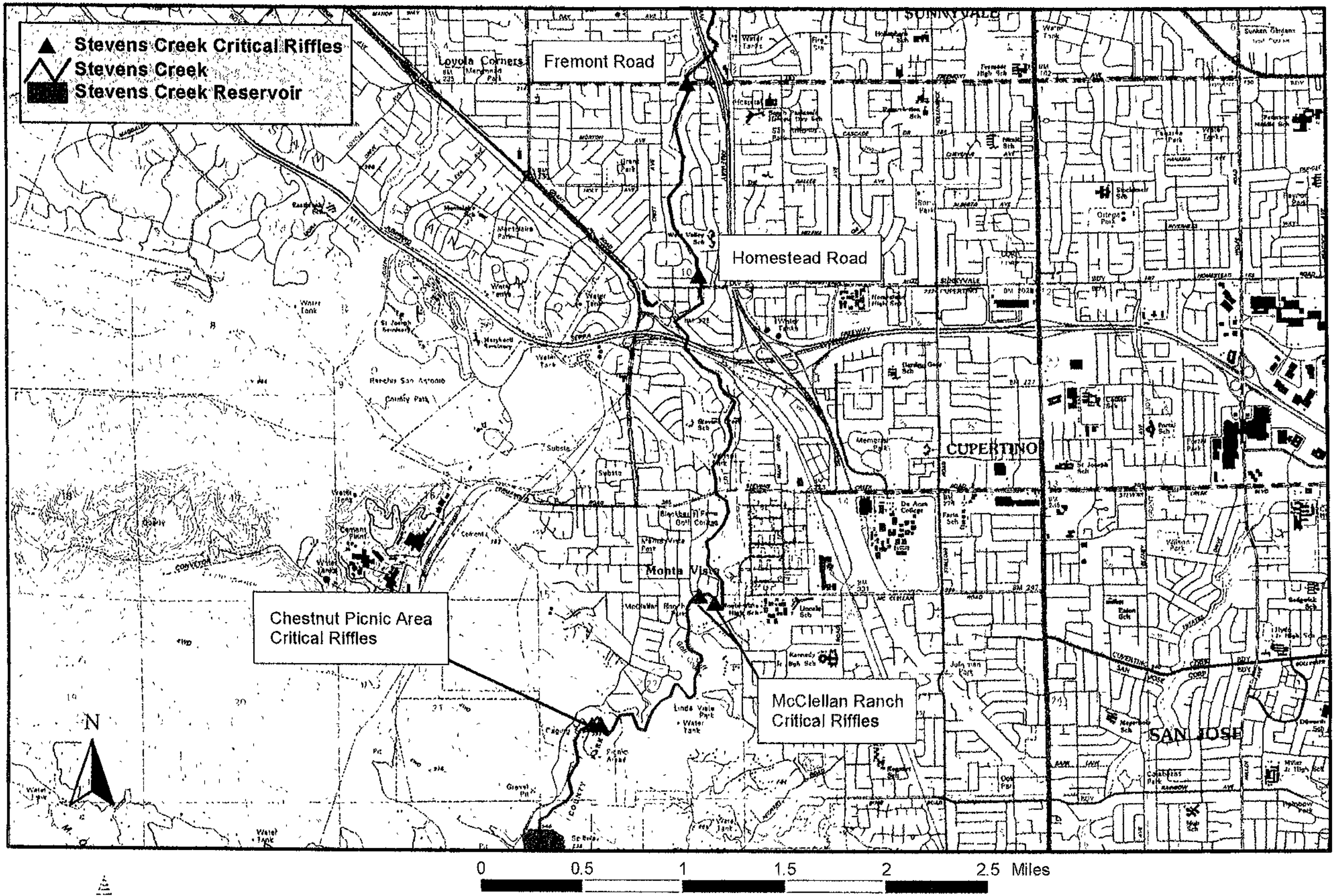
FIGURES



Balance Hydrologics, Inc.

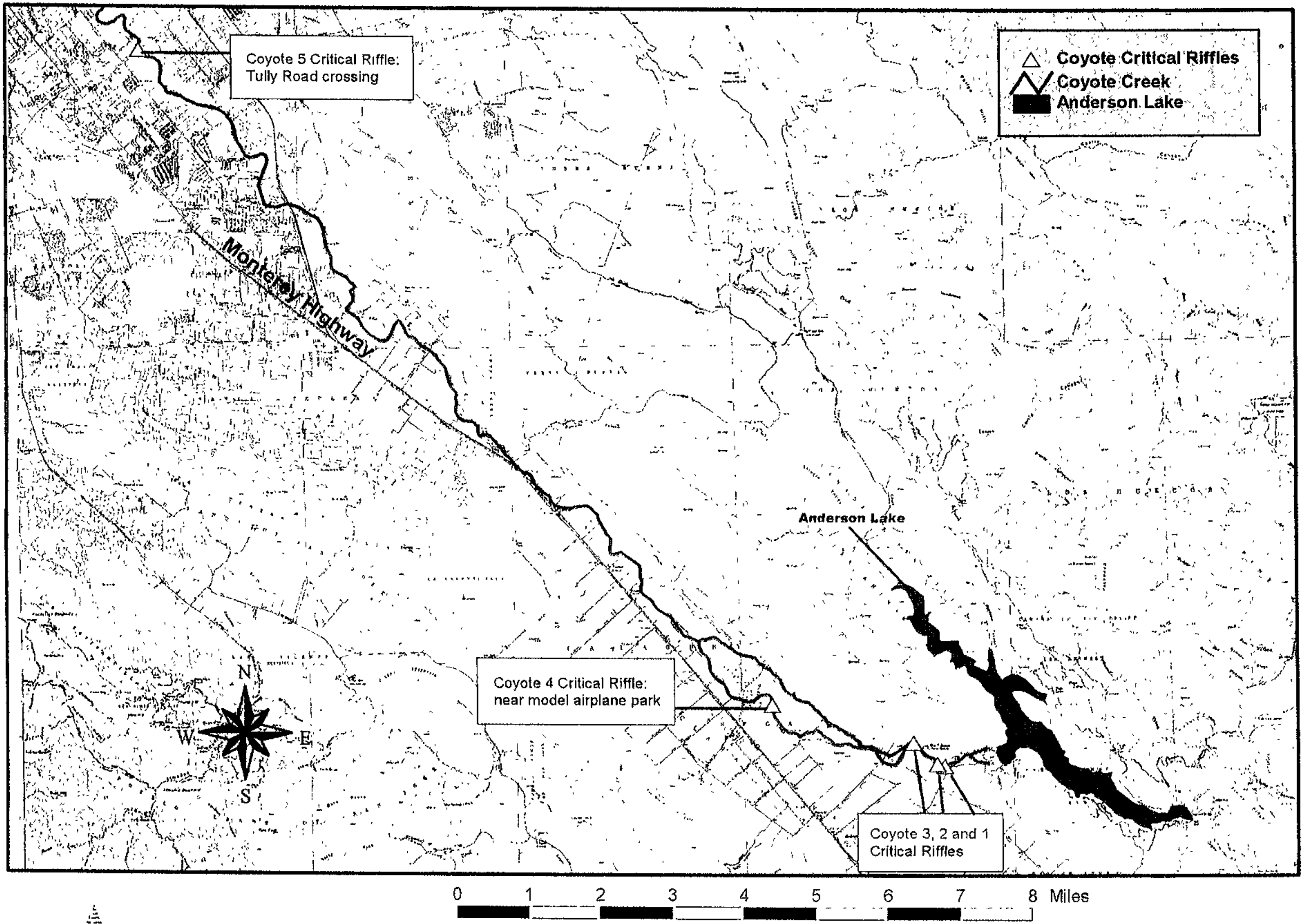
Figure 1: Regional location of investigated critical riffles on Stevens and Coyote Creeks, Santa Clara County.

A total of six critical riffles were investigated on Stevens Creek and a total of five on Coyote Creek.



Balance Hydrologics, Inc.

Figure 2: Locations of critical riffles level-surveyed and modeled, Stevens Creek, Santa Clara County. There were a total of six critical riffles identified, level-surveyed and modeled as a part of this project. Two riffles are located near the Chestnut Picnic Area, two near McClellan Ranch, one downstream of the Homestead Road crossing and one at the Fremont Road crossing.



Balance Hydrologics, Inc.

Figure 3: Locations of critical riffles level-surveyed and modeled, Coyote Creek,Santa Clara County. There were a total of five critical riffles identified, level-surveyed and modeled as a part of this project. Three are located within one-half mile of the Anderson Lake sprillway, one is located near the Santa Clara County Model Airplane Park and one at the Tully Road crossing.

Figure 4

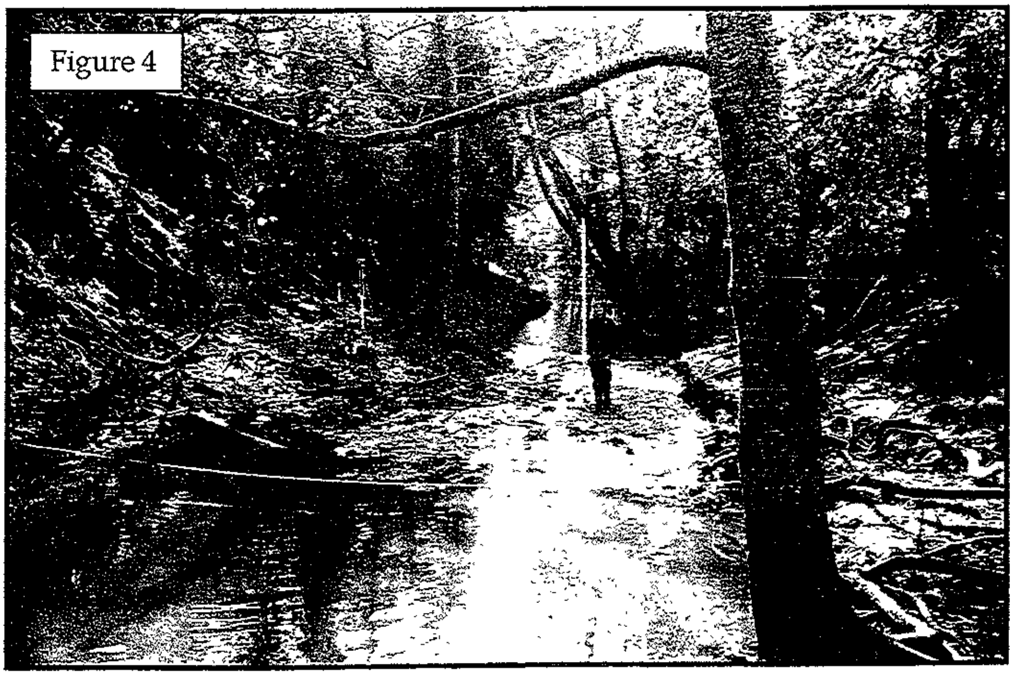
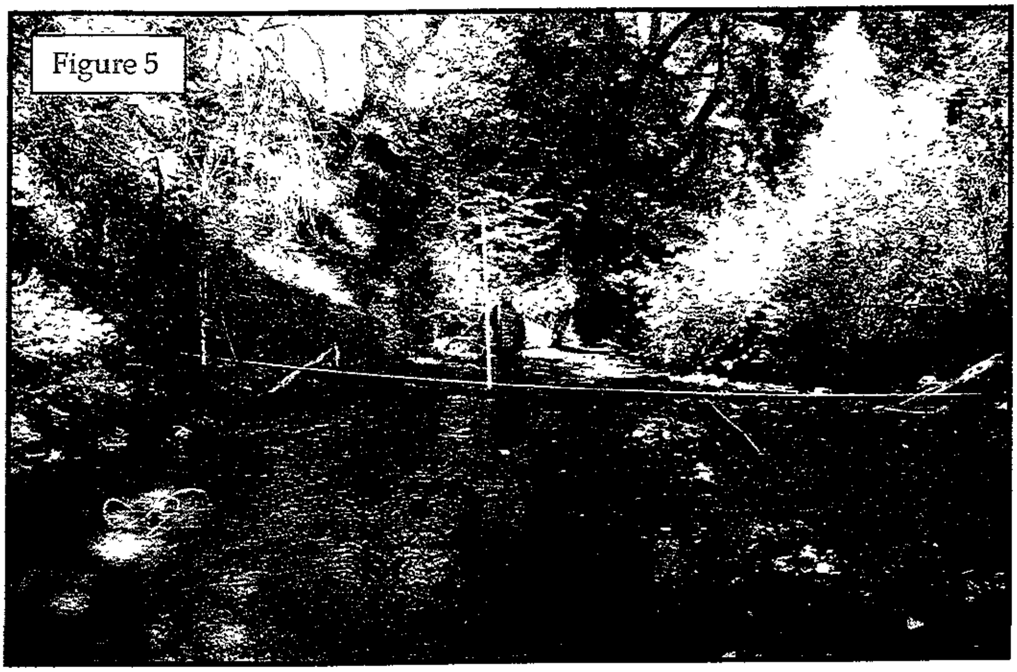


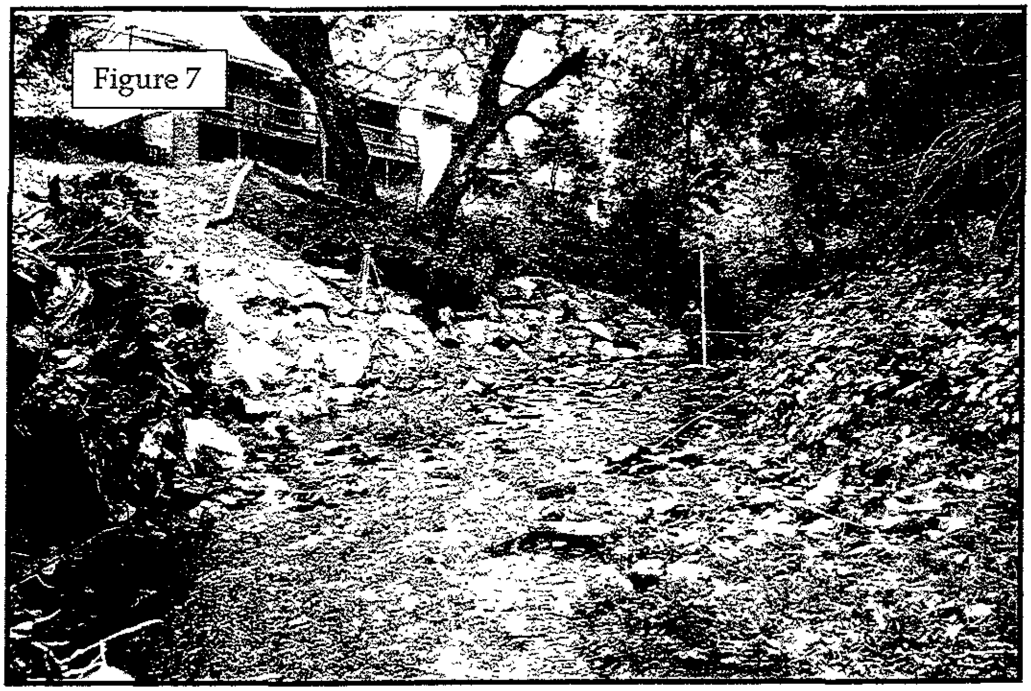
Figure 5



Balance Hydrologics, Inc.

Photographs of Steep Chestnut and Chestnut BH-3 critical riffles, Stevens Creek, Santa Clara County.

The top photograph (Figure 4) is looking downstream at Steep Chestnut critical riffle. The bottom photograph is looking downstream at Chestnut BH-3 critical riffle. Both riffles are located near the Chestnut Park Picnic Area just north of Stevens Creek Reservoir.



Balance Hydrologics, Inc.

Photographs of McClellan Ranch and Homestead Road critical riffles, Stevens Creek, Santa Clara County.

The top photograph (Figure 6) is looking downstream from the right-bank at McClellan Ranch critical riffle. The bottom photograph is looking upstream at Homestead Road critical riffle. McClellan Ranch critical riffle is located near the garden at the back of the McClellan Ranch Nature Center while Homestead Road critical riffle is located just downstream of the Homestead Road Bridge crossing.

Figure 8

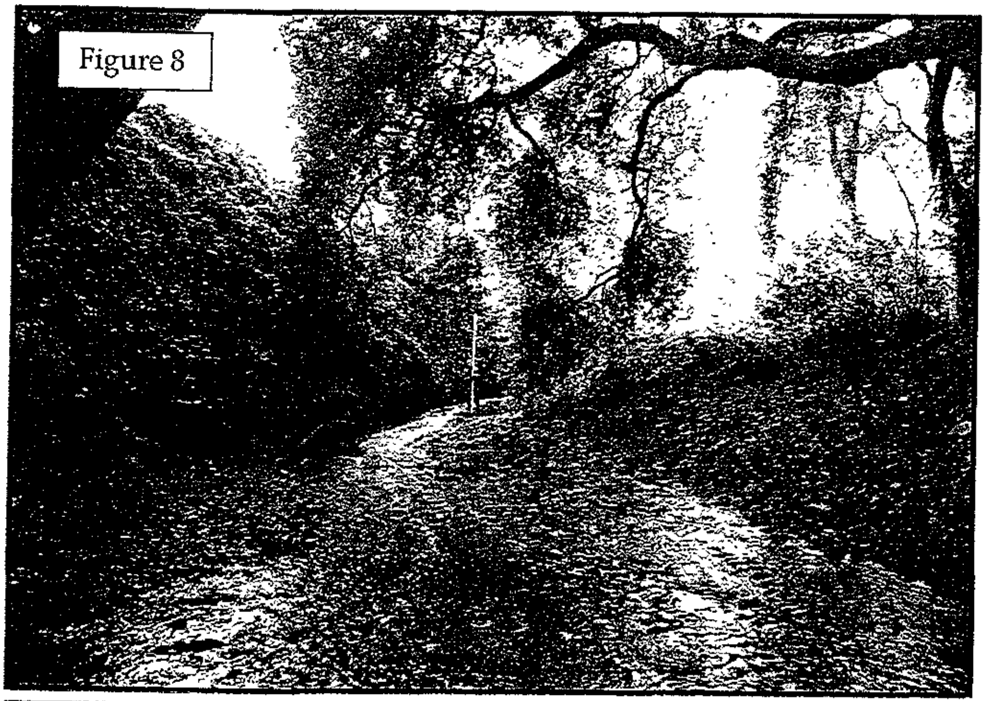
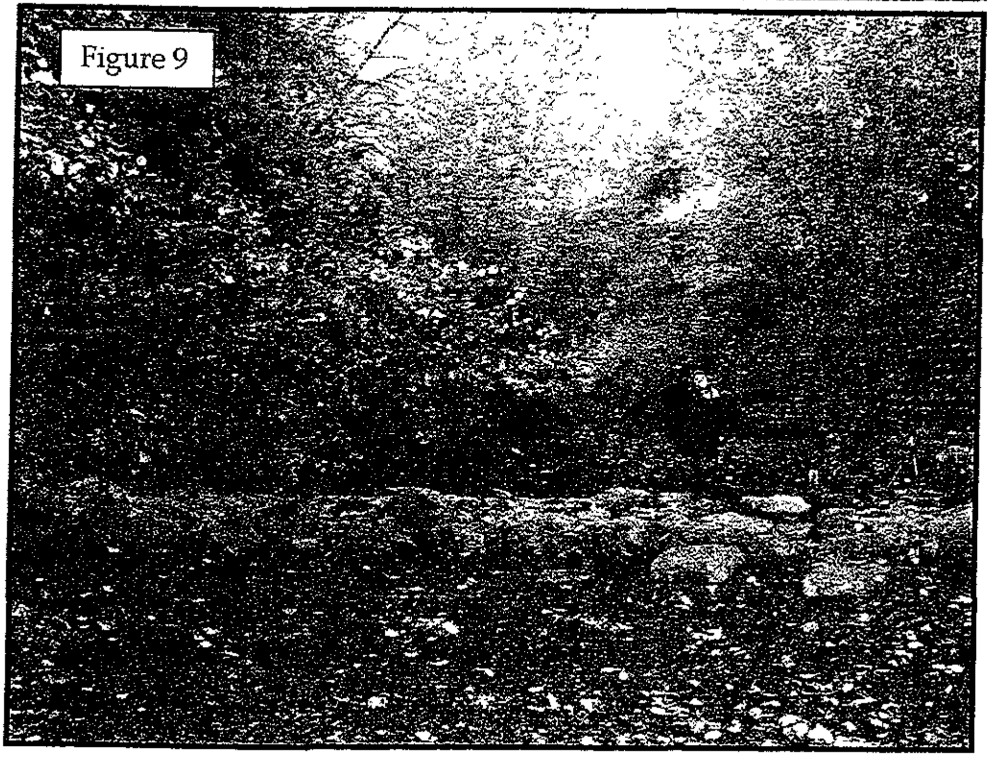


Figure 9



Balance Hydrologics, Inc.

Photographs of Fremont Road Critical Riffle and a Fish Passage Barrier Located Downstream of Fremont Road, Stevens Creek, Santa Clara County.

The top photograph (Figure 8) is looking downstream from beneath the bridge crossing at Fremont Road critical riffle. The bottom photograph is looking downstream at a fish passage barrier roughly 1 mile downstream of Fremont Road. Fremont Road critical riffle is located beneath the Fremont Road Bridge crossing.

Figure 10

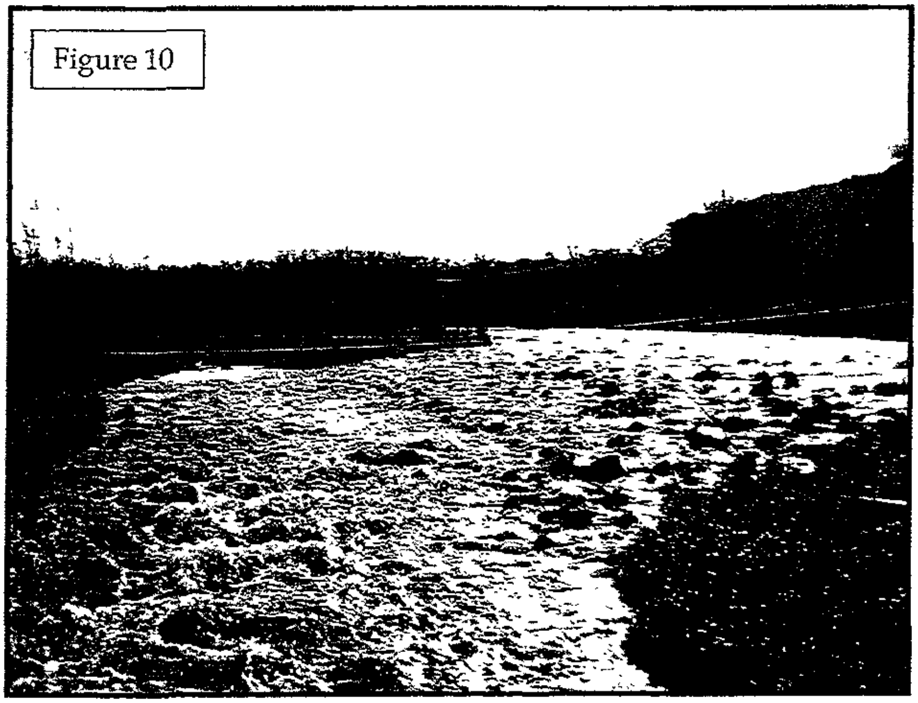
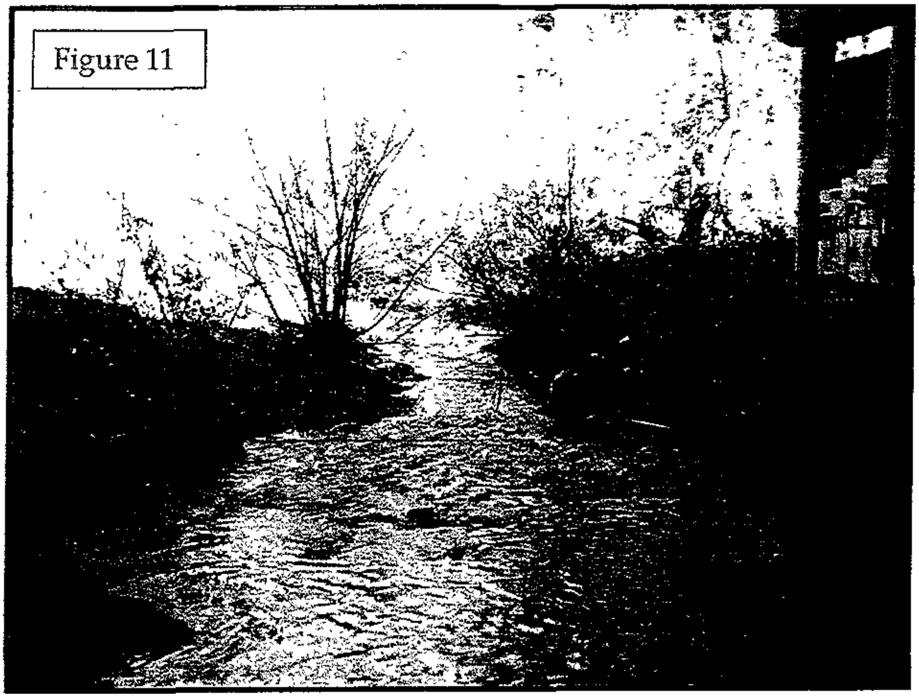


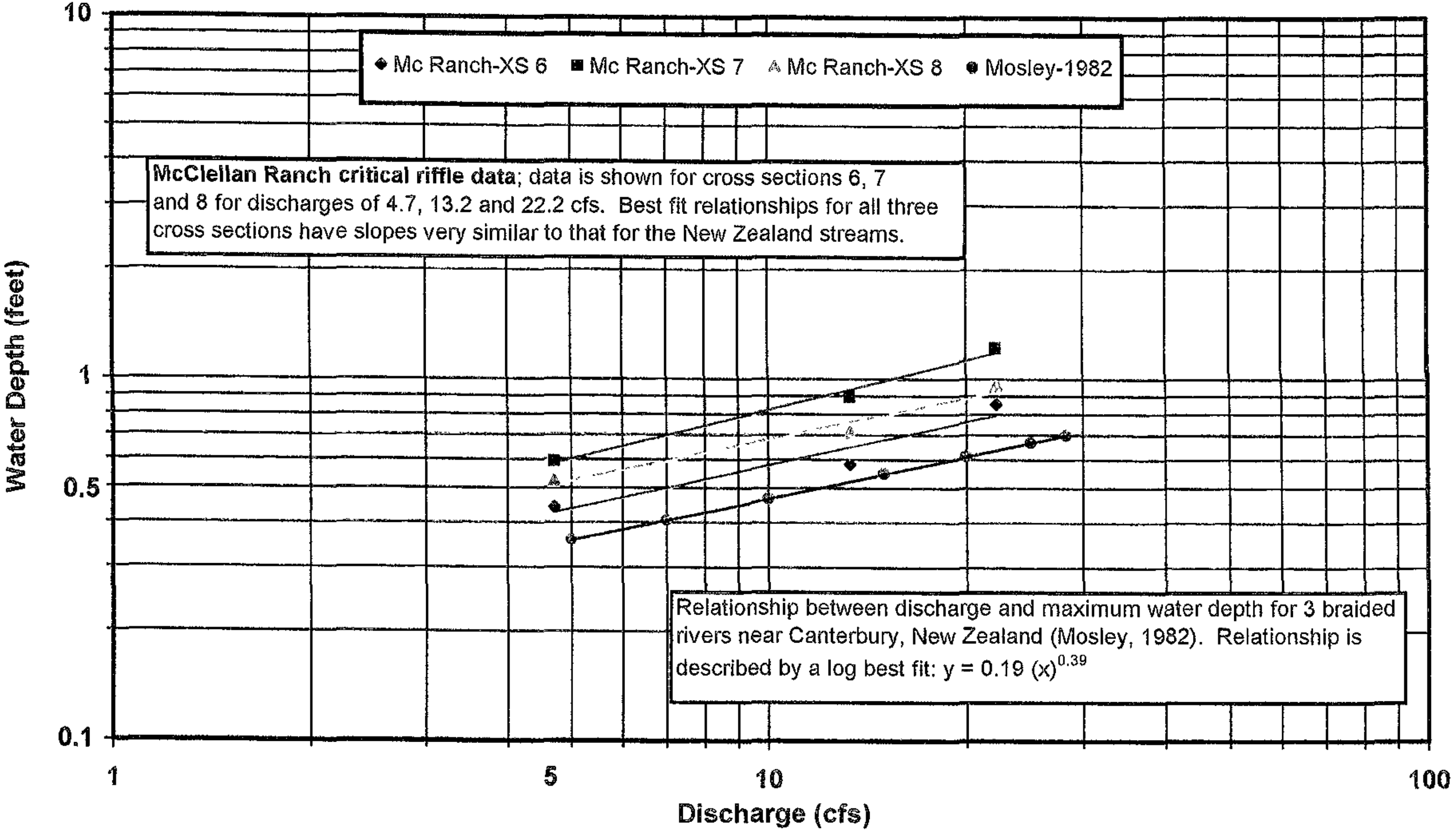
Figure 11



Balance Hydrologics, Inc.

Photographs of Coyote 3 and Coyote 5 Critical Riffles, Stevens Creek, Santa Clara County.

The top photograph (Figure 10) is looking upstream at Coyote 4 critical riffle. The bottom photograph is looking downstream at Coyote 5 critical riffle. Coyote 4 critical riffle is located near the Santa Clara County model Airplane Park. Coyote 5 critical riffle is located beneath the Tully Road Bridge crossing.



McClellan Ranch critical riffle data; data is shown for cross sections 6, 7 and 8 for discharges of 4.7, 13.2 and 22.2 cfs. Best fit relationships for all three cross sections have slopes very similar to that for the New Zealand streams.

Relationship between discharge and maximum water depth for 3 braided rivers near Canterbury, New Zealand (Mosley, 1982). Relationship is described by a log best fit: $y = 0.19\ (x)^{0.39}$

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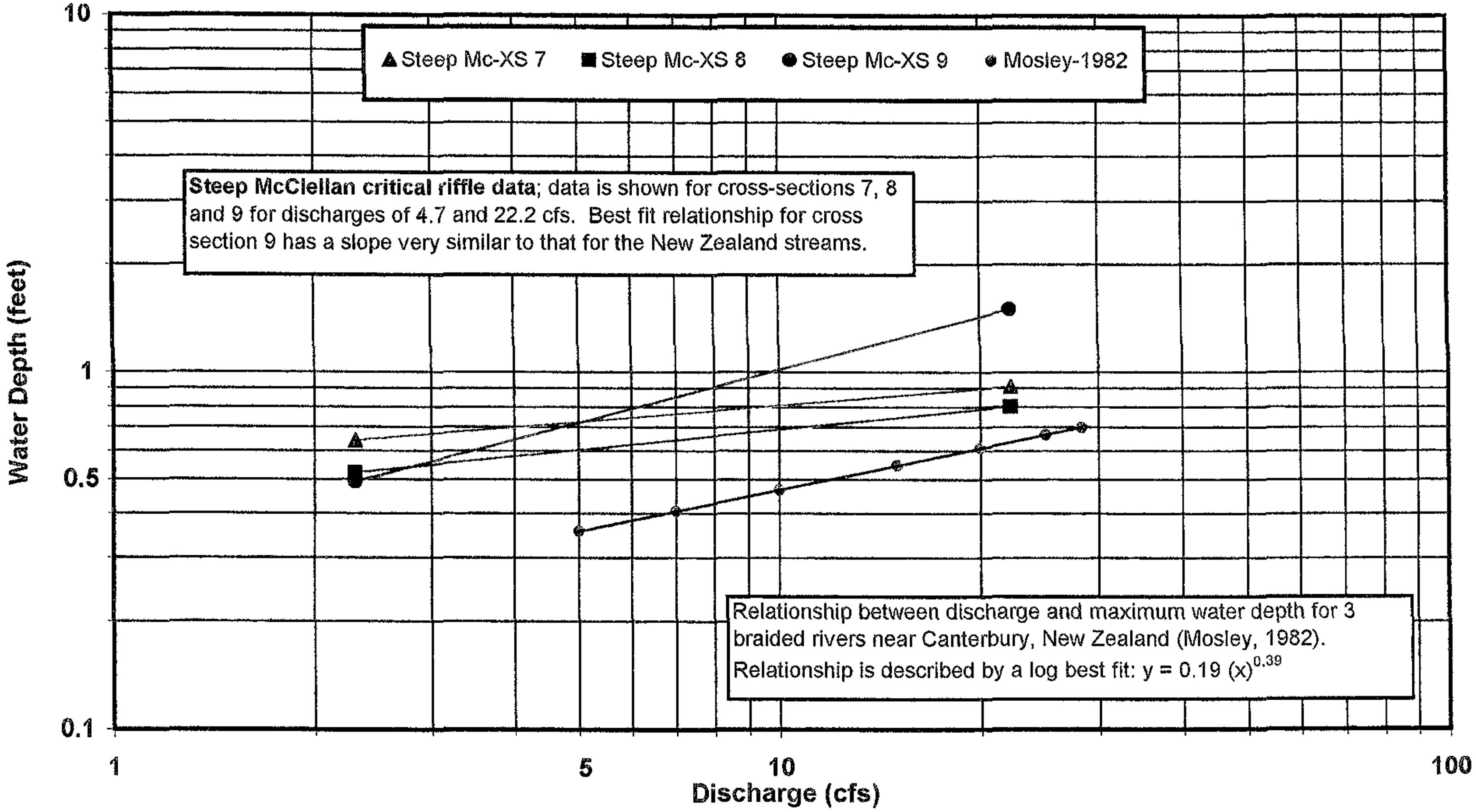
Figure 12: Plot of discharge versus corresponding maximum water depth for each riffle cross section, McClellan Ranch critical riffles, Stevens Creek, Santa Clara County. Maximum water depth at each cross section is plotted against the discharge measured at the time of water depth observation. Also included is data for three braided rivers near Canterbury, New Zealand (Mosley, 1982).



Steep McClellan critical riffle data; data is shown for cross-sections 7, 8 and 9 for discharges of 4.7 and 22.2 cfs. Best fit relationship for cross section 9 has a slope very similar to that for the New Zealand streams.

Relationship between discharge and maximum water depth for 3 braided rivers near Canterbury, New Zealand (Mosley, 1982). Relationship is described by a log best fit: $y = 0.19 (x)^{0.39}$

Balance Hydrologics, Inc.

Figure 13: Plot of discharge versus corresponding maximum water depth for each cross section, Steep McClellan critical riffles, Stevens Creek, Santa Clara County.
Maximum water depth at each cross section is plotted against the discharge measured at the time of observation. Also included is data for three braided rivers near Canterbury, New Zealand (Mosley, 1982).

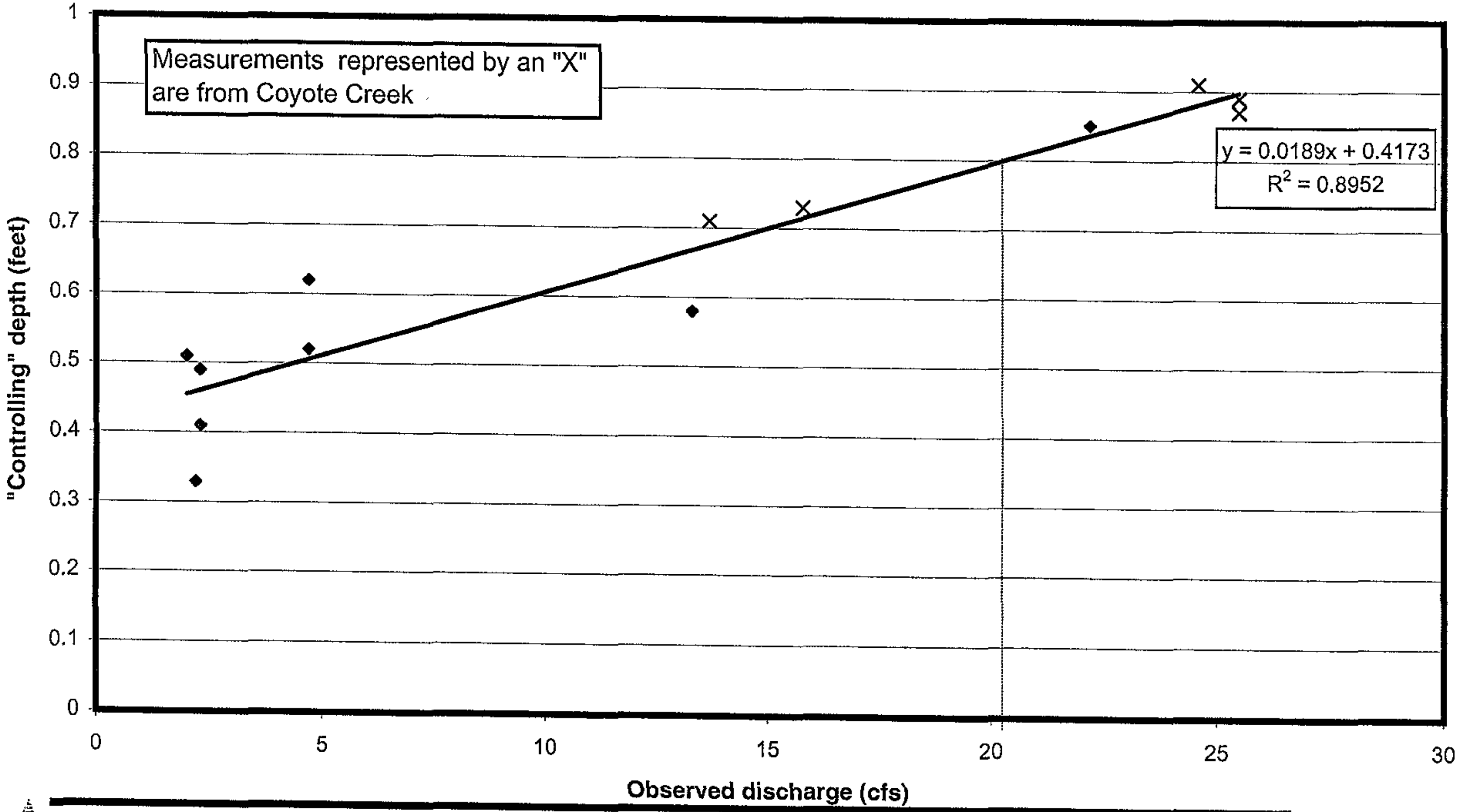


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Figure 14. "Controlling" depth versus discharge for critical riffles on Stevens Creek and Coyote Creek, Santa Clara Valley, California. Note that there is increased scatter at the lowest discharge values, perhaps due to the impact of individual riffle elements at low flow. The estimated passage depth would be on the order of 20 cfs.

APPENDICES

APPENDIX A

Project Number	200105
Stream	Stevens Creek
Location	Chestnut Picnic Area, BH3
Date	11/20/2000, 11/30/2000
Time	750-1230
Length of Reach Measured (feet)	219.00
Length of Riffle (feet)	44.00
Q measured (cfs)	4.70
Riffle Slope (%)	0.039

Comments for Reach

Sunny and cool (10 degrees celcius), water slightly turbid
Visual Estimates: *D50-medium pebbles, 20% embedded*
Visual Estimate of Flow: 3-4 cfs
Most flow through left 1/6 of riffle

Bankfull difficult to determine due to presence of large sycamore at head of riffle an

Dense riparian vegetation along right bank, bank is also very steep on the left bank

Avg. Riffle Width (feet) 24.0

Station	BS	HI	FS	Elevation (feet)	Water Depth (feet)	Water Surface Elevation	Comments
Station Location	longitudinal station 0.0 feet, pool at head of riffle						
BM 1	3.79	103.79		100.00			X-sections 1-4 measured on11/30/2000
BM 2		103.79	5.72	98.07			nail in large leaf maple (?)
1-1'							red x on large rip rap-right bank
Thalweg		103.79	7.28	96.51	1.40	97.91	
Station Location	longitudinal station 20 feet, pool at head of riffle						
2-2'							
Thalweg		103.79	7.22	96.57	1.35	97.92	
Station Location	longitudinal station 43 feet, pool at head of riffle						
3-3'							
Thalweg		103.79	6.82	96.97	0.90	97.87	
Station Location	longitudinal station 55 feet, pool at head of riffle						
4-4'							
Thalweg		103.79	6.70	97.09	0.79	97.88	
Station Location	longitudinal station 99.1 feet, pool at head of riffle						
BM 1	4.07	104.07		100.00			X-sections 5-9 measured on 11/20/2000
BM 2		104.07	6.00	98.07			top of spike in base of sycamore
5-5'							high point on rip rap marked with an X
3.0		104.07	6.33	97.74			
6.0		104.07	7.10	96.97	0.75	97.46	LEW
9.0		104.07	6.82	97.25	0.49	97.57	
12.0		104.07	6.66	97.41	0.32	97.60	
15.0		104.07	6.52	97.55	0.19	97.60	
18.0		104.07	6.37	97.70	0.05	97.70	
21.3		104.07	6.33	97.74			REW
Station Location	longitudinal station 105 feet, crest of riffle						
9.5		104.07	6.85	97.22	0.52	97.22	

Station Location	longitudinal station 109.9 feet, below crest of riffle					
6-6'						
0.0	104.07	3.2	100.87			LE top of pin
1.6	104.07	4.51	99.56			bankfull/highwater 2000?
4.0	104.07	5.44	98.63			top of bank
4.7	104.07	6.78	97.29	1.6 ,	97.80	LEW, bottom of bank
6.0	104.07	7.1	96.97	0.51	97.50	cobbles and gravels
8.0	104.07	7.12	96.95	0.53	97.43	cobbles and gravels
10.0	104.07	7.05	97.02	0.48	97.51	cobbles and gravels
12.0	104.07	7.03	97.04	0.49	97.04	cobbles and gravels
14.0	104.07	6.34	97.73	0	98.00	top of cobble
16.0	104.07	6.88	97.19	0.27	97.45	
18.0	104.07	6.88	97.19	0.26	97.21	
20.0	104.07	6.66	97.41	0.02	97.41	
22.0	104.07	6.54	97.53			REW, edge of gravel bar
26.0	104.07	6.51	97.56			gravel bar
29.0	104.07	6.3	97.77			gravel bar
33.0	104.07	6.07	98.00			start of riparian vegetation
37.0	104.07	5.25	98.82			riparian vegetation
39.6	104.07	3.14	100.93			riparian vegetation
40.5	104.07	2.27	101.80			RE base of pin
40.5	104.07	2.04	102.03			RE top of pin
Station Location	longitudinal station 128.3 feet, middle of riffle					
7-7'						
0.0	104.07	1.02	103.05			LE top of pin
0.0	104.07	1.37	102.70			LE base of pin
1.2	104.07	3.85	100.22			cut bank
3.0	104.07	7.2	96.87	0	96.87	LEW, behind downed tree
4.0	104.07	7.38	96.69	0.46	97.15	cobbles and gravel
6.0	104.07	7.53	96.54	0.62	97.16	"
8.0	104.07	7.42	96.65	0.53	97.18	"
10.2	104.07	6.83	97.24	0	97.24	top of cobble
12.0	104.07	7.34	96.73	0.31	97.04	cobbles and gravels
14.0	104.07	7.24	96.83	0.19	97.02	"
16.0	104.07	7.11	96.96	0.11	97.07	"
18.0	104.07	7.07	97.00	0.1	97.10	"
20.0	104.07	7.1	96.97	0.19	97.16	gravels
22.0	104.07	7.14	96.93	0.13	97.06	"
24.0	104.07	7.22	96.85	0.25	97.10	"
26.0	104.07	7.22	96.85	0.24	97.09	"
26.9	104.07	7.02	97.05	0	97.05	REW
27.5	104.07	5.63	98.44			
28.5	104.07	4.85	99.22			
31.0	104.07	3.64	100.43			
34.4	104.07	2.91	101.16			RE base of pin
34.4	104.07	2 6	101.47			RE top of pin
Station Location	longitudinal station 146.7 feet, toe of riffle					
8-8'						
0.0	104.07	4.85	99.22			LE top of pin
0.0	104.07	5.05	99.02			LE base of pin

1.1		104.07	7.95	96.12		0.5	96.62	LEW, base of cutbank
3.0		104.07	8.31	95.76		0.87	96.63	behind car part, pool formed because of obstruction
5.0		104.07	8.48	95.59		1.01	96.60	"
7.0		104.07	8.28	95.79		0.79	96.58	
10.0		104.07	8.02	96.05		0.48	96.53	base of gravel bar
12.0		104.07	7.68	96.39		0.16	96.55	gravel bar
14.0		104.07	7.38	96.69		0.03	96.72	"
16.0		104.07	7.35	96.72		0.07	96.79	"
18.4		104.07	7.27	96.80		0	96.80	REW
20.0		104.07	6.9	97.17				gravels
24.2		104.07	5.76	98.31				gravel bank
28.3		104.07	4.28	99.79				sand and thick willows
30.2		104.07	3.77	100.30				RE base of pin
30.2		104.07	3.42	100.65				RE top of pin
Station Location **9-9'**	longitudinal station 153.5 feet, below toe of riffle							
4.0		104.07	7.95	96.12	0.35		96.47	LEW, behind logjam
7.0		104.07	8.45	95.62	0.85		96.47	next to tire
9.7		104.07	8.38	95.69	0.79		96.48	
12.5		104.07	8.38	95.69	0.81		96.50	
15.0		104.07	8.0	96.07	0.48		96.55	
17.8		104.07	7.6	96.47	0		96.47	REW
BM 1	4.07	104.07		100.00				Closure
BM 2		104.07	6.0	98.07				Closure, for measurement of X-sections 5-9
Station Location **10-10'**	longitudinal station 164 feet, pool at head of riffle							
Thalweg		103.79	7.97	95.82	0.55		96.37	
Station Location **11-11'**	longitudinal station 173 feet, pool at head of riffle							
Thalweg		103.79	8.57	95.22	0.85		96.07	
Station Location **12-12'**	longitudinal station 193 feet, pool at head of riffle							
Thalweg		103.79	8.98	94.81	1.15		95.96	
Station Location **13-13'**	longitudinal station 207 feet, pool at head of riffle							
Thalweg		103.79	9.14	94.65	1.32		95.97	
Station Location **14-14'**	longitudinal station 219 feet, pool at head of riffle							
Thalweg		103.79	9.08	94.71	1.22		95.93	
BM 1	3.79	103.79		100.00				Closure
BM 2		103.79	5.72	98 07				Closure, for measurement of X-sections 1-4, 10-14

Project Number	200105
Stream	Stevens Creek
Location	Chestnut Picnic Area, Steep Chestnut
Date	11/30/00
Time	830-1230
Length of Reach Measured (feet)	124.00
Length of Riffle (feet)	38.00
Q measured (cfs)	2.80

Comments for Reach

Sunny and cool (10 degrees celcius)
Visual Estimates: D50-medium pebbles, 10-20% embedded, bed covered in algae
Visual Estimate of Flow: 3-4 cfs
Most flow through right 1/5 of riffle

Riffle Slope (%)	0.041
Avg. Riffle Width (feet)	17.8

Station	BS	HI	FS	Elevation (feet)	Water Depth (feet)	Water Surface Elevation	Comments
Station Location	longitudinal station 0 feet, pool at head of riffle						
BM 1	4.80	104.80		100.00			top of spike in base of sycamore
BM 2		104.80	2.78	102.02			high point on rip rap marked with an X
1-1'							
Thalweg		104.80	9.04	95.76	2.79	98.55	
Station Location	longitudinal station 10 feet, pool at head of riffle						
2-2'							
Thalweg		104.80	9.05	95.75	2.79	98.54	
Station Location	longitudinal station 29.2 feet, pool at head of riffle						
3-3'							
1.0		104.80	6.50	98.30			
2.0		104.80	7.84	96.96	1.6	98.56	LEW, steep channel bank
4.0		104.80	7.76	97.04	1.52	98.56	
6.0		104.80	7.53	97.27	1.28	98.55	
8.0		104.80	7.14	97.66	0.90	98.56	small gravels
10.0		104.80	6.77	98.03	0.52	98.55	
12.0		104.80	6.74	98.06	0.49	98.55	
14.0		104.80	6.72	98.08	0.46	98.54	
16.0		104.80	6.68	98.12	0.42	98.54	
18.0		104.80	6.71	98.09	0.45	98.54	small gravels
20.7		104.80	6.71	98.09	0.46	98.55	REW
Station Location	longitudinal station 40 feet, crest of riffle						
4-4'							
17.0		104.80	6.65	98.15	0.32	98.47	on cobble
22.8		104.80	6.57	98.23	0.27	98.50	
Station Location	longitudinal station 46 feet, top of riffle						
5-5'							
1.0		104.80	1.94	102.86			LE top of nail, nail in tree root
2.0		104.80	4.24	100.56			steep bank through old deposit

4.0	104.80	5.17	99.63			"
6.0	104.80	6.20	98.60			base of bank
6.6	104.80	6.32	98.48	0	98.48	L EW on gravels
8.0	104.80	6.34	98.46	0	98.46	on leaves
10.0	104.80	6.50	98.30	0.16	98.46	gravels and leaves
12.0	104.80	6.58	98.22	0.23	98.45	gravels and leaves
14.0	104.80	6.65	98.15	0.26	98.41	gravels
16.0	104.80	6.74	98.06	0.35	98.41	below cobble
18.0	104.80	6.74	98.06	0.32	98.38	
20.0	104.80	6.77	98.03	0.33	98.36	amongst gravel
22.0	104.80	6.98	97.82	0.32	98.14	
24.0	104.80	6.42	98.38	0	98.38	on cobble
26.0	104.80	7.24	97.56	0.57	98.13	gravels
27.8	104.80	6.71	98.09	0	98.09	REW, behind log jam
28.5	104.80	5.80	99.00			top of bank
30.0	104.80	5.33	99.47			on root
32.0	104.80	4.80	100.00			
34.9	104.80	4.23	100.57			RE base of pin
34.9	104.80	4.03	100.77			RE top of pin
Station Location	longitudinal station 58.3 feet, middle of riffle					
6-6'						
0.0	104.80	2.99	101.81			LE top of nail, nail in tree root
0.0	104.80	4.05	100.75			LE bottom of pin
2.0	104.80	4.80	100.00			gravels and leaves
4.0	104.80	5.17	99.63			gravels and leaves
6.0	104.80	5.72	99.08			gravels and leaves
7.7	104.80	6.07	98.73			edge of bank
9.0	104.80	6.83	97.97	0	97.97	LEW base of bank
11.0	104.80	6.92	97.88	0.01	97.89	gravels
13.0	104.80	7.02	97.78	0.11	97.89	gravels
15.0	104.80	6.94	97.86	0.05	97.91	on gravels
17.0	104.80	6.92	97.88	0	97.88	on gravel
19.0	104.80	7.28	97.52	0.23	97.75	
21.0	104.80	7.53	97.27	0.46	97.73	gravels
23.0	104.80	7.65	97.15	0.6	97.75	
25.0	104.80	7.65	97.15	0.69	97.84	
26.6	104.80	7.12	97.68	0.06	97.74	REW
28.0	104.80	6.03	98.77			top of bank, below root
30.0	104.80	4.86	99.94			
32.0	104.80	4.32	100.48			bare hardened soil
36.0	104.80	3.31	101.49			RE base of pin
36.0	104.80	2.66	102.14			RE top of pin
Station Location	longitudinal station 69.2 feet, toe of riffle, riffle extends to 78 feet					
7-7'						
0.0	104.80	3.98	100.82			LE top of nail, nail in tree root
0.0	104.80	4.38	100.42			LE bottom of pin
1.0	104.80	4.66	100.14			~ bankfull indicator
3.0	104.80	5.13	99.67			gravels and roots
5.0	104.80	5.43	99.37			"
7.0	104.80	5.80	99.00			"

9.0		104.80	6.20	98.60			"
11.0		104.80	6.80	98.00			descending bank
12.3		104.80	7.58	97.22	0.12	98.12	LEW
14.0		104.80	7.68	97.12	0.14	97.36	
16.0		104.80	7.73	97.07	0.2	97.32	cobbles and gravels
18.0		104.80	7.81	96.99	0.32	97.39	"
20.0		104.80	7.85	96.95	0.39	97.38	"
22.0		104.80	8.02	96.78	0.51	97.46	"
24.0		104.80	7.80	97.00	0.29	97.07	"
24.9		104.80	7.61	97.19	0.12	97.12	REW
26.0		104.80	6.18	98.62			top of bank
28.0		104.80	5.35	99.45			bare hardened soil and roots
30.8		104.80	4.55	100.25			
33.9		104.80	3.11	101.69			RE base of pin
33.9		104.80	2.77	102.03			RE top of pin, BM 2
Station Location	longitudinal station 75.8 feet, pool below riffle						
8-8'							
5.2		104.80	8.22	96.58	0.44	97.02	LEW
8.0		104.80	9.70	95.10	1.90	97.00	
10.0		104.80	9.88	94.92	2.11	97.03	
12.0		104.80	9.97	94.83	2.19	97.02	
14.0		104 80	9.68	95.12	1.91	97.03	
16.0		104.80	9.46	95.34	1.7	97.04	
17.9		104.80	8.40	96.40	0.64	97.04	REW
Station Location	longitudinal station 109 feet, pool below riffle						
9-9'							
Thalweg		104.80	9.88	94.92	2.12	97.04	
Station Location	longitudinal station 124 feet, pool below riffle						
10-10'							
Thalweg		104.80	9.36	95.44	1.6	97.04	
BM 1	4.79	104.80		100.01			Closure
BM 2		104.80	2.8	102.03			Closure

Project Number	200105
Stream	Stevens Creek
Location	McClellan Ranch
Date	11/20/2000, 11/30/2000
Time	1345-1645
Length of Reach Measured (feet)	189.00
Length of Riffle (feet)	43.00
Q measured (cfs)	4.70

Comments for Reach

Sunny and cool (10 degrees celcius), water slightly turbid
Visual Estimates: D50-medium pebbles, 30% embedded
Visual Estimate of Flow: 3-4 cfs
Algae on bed, more leaves and organic matter present from previous location

Slope (%)	0.036
Avg. Riffle Width (feet)	19.8

Station	BS	HI	FS	Elevation (feet)	Water Depth (feet)	Water Surface Elevation	Comments
Station Location	longitudinal station 0 feet, pool at head of riffle						X-sections 1-3 measured on 11/30/2000
BM 1	3.29	103.29		100.00			top of spike in base of sycamore
BM 2		103.29	4.52	98.77			high point on rip rap marked with an X
1-1'							
Thalweg		103.29	8.85	94.44	2.14	96.58	
Station Location	longitudinal station 31 feet, pool at head of riffle						
2-2'							
Thalweg		103.29	8.85	94.44	2.13	96.57	
Station Location	longitudinal station 64 feet, pool at head of riffle						
3-3'							
Thalweg		103.29	7.66	95.63	0.93	96.56	
Station Location	longitudinal station 82 feet, pool at head of riffle						X-sections 4-10 measured on 11/20/2000
BM 1	3.59	103.59		100.00			top of spike in base of sycamore
BM 2		103.59	4.83	98.76			high point on rip rap marked with an X
4-4'							
3.0		103.59	5.99	97.60			LE pin upstream of sycamore tree
5.0		103.59	6.66	96.93			
5.9		103.59	7.32	96.27	0.00	96.27	LEW
8.0		103.59	7.54	96.05	0.23	96.28	large gravels
10.0		103.59	7.63	95.96	0.33	96.29	"
12.0		103.59	7.61	95.98	0.30	96.28	"
14.0		103.59	7.62	95.97	0.33	96.30	large gravels and small cobbles
16.0		103.59	7.60	95.99	0.34	96.33	"
18.0		103.59	7.55	96.04	0.29	96.33	"
20.0		103.59	7.53	96.06	0.26	96.32	"
22.0		103.59	7.49	96.10	0.22	96.32	gravels
24.0		103.59	7.42	96.17	0.22	96.39	"

26.0	103.59	7.41	96.18	0.21	96.39	small cobbles and large gravels
28.0	103.59	7.43	96.16	0.21	96.37	"
30.8	103.59	7.23	96.36	0.00	96.36	REW
33.0	103.59	6.56	97.03			bare soil slope (~ 45 degrees)
37.2	103.59	4.21	99.38			RE top of nail in 3rd stair from the bottom
Station Location	longitudinal station 91 feet, downstream end of pool at head of riffle					
5-5'						
4.5	103.59	7.96	95.63	0.66	96.29	LEW
9.0	103.59	8.03	95.56	0.72	96.28	
13.0	103.59	7.77	95.82	0.43	96.25	
18.0	103.59	7.64	95.95	0.30	96.25	
22.0	103.59	7.45	96.14	0.11	96.25	
24.5	103.59	7.34	96.25			REW
27.7	103.59	6.59	97.00			bare soil bank
Station Location	longitudinal station 96 feet, crest of riffle					
11.4	103.59	7.77	95.82	0.43	96.25	
17.6	103.59	7.54	96.05	0.19	96.24	
Station Location	longitudinal station 100.7 feet, below crest of riffle					
6-6"						
0.0	103.59	3.59	100.00			LE top of pin
1.2	103.59	6.06	97.53			base of Sycamore root
3.0	103.59	7.09	96.50			top of small bank
3.8	103.59	7.96	95.63	0.18	95.81	LEW
6.0	103.59	7.65	95.94	0	95.94	top of cobble
7.3	103.59	8.07	95.52	0.45	95.97	amognst smaller cobbles
9.4	103.59	8.06	95.53	0.44	95.97	
10.0	103.59	7.47	96.12	0	96.12	top of piece of rip rap
12.1	103.59	7.96	95.63	0.37	96.00	amongst cobbles
14.1	103.59	7.76	95.83	0.22	96.05	
16.1	103.59	7.61	95.98	0	95.98	top of piece of rip rap
18.1	103.59	7.81	95.78	0.24	96.02	gravels
20.1	103.59	7.6	95.99	0.06	96.05	edge of cobble
22.1	103.59	7.63	95.96	0.1	96.06	gravels
24.0	103.59	7.49	96.10	0		REW
26.0	103.59	6.77	96.82			top of rip rap on bank
28.0	103.59	6.75	96.84			bare soil bank
30.4	103.59	5.27	98.32			
32.0	103.59	4.29	99.30			bank slope at base of flood deposit
34.3	103.59	2.27	101.32			RE base of pin
34.3	103.59	2.06	101.53			RE top of pin
Station Location	longitudinal station 113.5 feet, middle of riffle					
7-7'						
0.0	103.59	2.62	100.97			LE top of pin

0.0	103.59	2.84	100.75			LE base of pin
1.9	103.59	4.69	98.90			base of cutbank below surface that extends 100 meters
3.3	103.59	5.55	98.04			
4.9	103.59	6.68	96.91			
6.0	103.59	7.22	96.37			top of bank, bank littered with cobbles and gravels
6.6	103.59	7.97	95.62	0	96.21	LEW
8.1	103.59	8.18	95.41	0.44	95.82	amongst large gravels
10.1	103.59	8.56	95.03	0.59	95.26	"
12.1	103.59	8.43	95.16	0.41	95.16	amongst gravels
14.1	103.59	8.23	95.36	0.23	95.49	"
16.5	103.59	7.92	95.67	0	95.77	on top of small cobble
18.1	103.59	8.09	95.50	0.13	95.50	gravels
20.1	103.59	8.07	95.52	0.1	95.59	gravels
21.1	103.59	7.45	96.14	0	96.14	top of piece of rip rap
22.1	103.59	8	95.65	0.07	95.72	
24.7	103.59	7.94	96.02	0	96.02	REW, gravels
27.0	103.59	7.57	97.11			base of rip rap
28.6	103.59	6.48	97.89			rip rap
31.0	103.59	5.7	99.18			top of rip rap
35.0	103.59	4.41	100.24			base of bank
37.2	103.59	3.35	100.24			base of flood deposit
39.7	103.59	1.02	102.57			RE base of pin
39.7	103.59	0.87	102.72			RE top of pin

Station Location longitudinal station 134.3 feet, toe of riffle

8-8'

0.0	103.59	5.25	98.34			LE top of pin
0.0	103.59	5.49	98.10			LE base of pin
2.0	103.59	6.03	97.56			
3.0	103.59	6.66	96.93			flat sandy surface behind cottonwood
5.2	103.59	7.06	96.53			edge of flat surface
6.1	103.59	7.82	95.77			base of old log
7.5	103.59	8.8	94.79	0	94.79	LEW
9.0	103.59	8.82	94.77	0.09	94.86	top of cobble
10.6	103.59	9.2	94.39	0.52	94.91	amongst cobbles
12.1	103.59	9.07	94.52	0.46	94.98	"
13.0	103.59	8.77	94.82	0.16	94.98	top of cobble
14.1	103.59	9.03	94.56	0.32	94.88	large gravels
16.1	103.59	9.05	94.54	0.37	94.91	"
18.5	103.59	8.82	94.77	0	94.77	top of rip rap
20.1	103.59	9.06	94.53	0.24	94.77	
21.6	103.59	8.87	94.72	0	94.72	REW, start of rip rap bank with elderberries (?)
23.1	103.59	7.72	95.87			on rip rap
25.2	103.59	6.43	97.16			"
27.3	103.59	4.84	98.75			RE X on boulder, BM 2

Station Location longitudinal station 144 feet, pool below toe of riffle

9-9'

5.5		103.59	9.01	94.58	0	94.58	LEW
13.0		103.59	9.65	93.94	0.73	94.67	
15.0		103.59	9.66	93.93	0.79	94.72	
16.3		103.59	8.96	94.63	0	94.63	REW, on rip rap
Station Location 10-10'	longitudinal station 147 feet, pool below toe of riffle						
6.1		103.59	8.94	94.65	0	94.65	LEW
11.0		103.59	10.1	93.49	1.2	94.69	
13.0		103.59	10.27	93.32	1.39	94.71	
15.2		103.59	10.07	93.52	1.15	94.67	
15.3		103.59	8.97	94.62	0		REW, on rip rap
BM 1	3.6	103.59		99.99			Closure
BM 2		103.59	4.83	98.76			Closure
Station Location 11-11'	longitudinal station 151 feet, pool below toe of riffle						X-sections 11-15 measured on 11/30/2000
Thalweg		103.29	9.91	93.38	1.10	94.48	
Station Location 12-12'	longitudinal station 161 feet, pool below toe of riffle						
Thalweg		103.29	10.71	92.58	1.02	93.60	
Station Location 13-13'	longitudinal station 168 feet, pool below toe of riffle						
Thalweg		103.29	11.05	92.24	1.38	93.62	
Station Location 14-14'	longitudinal station 179 feet, pool below toe of riffle						
Thalweg		103.29	12.03	91.26	2.34	93.60	
Station Location 15-15'	longitudinal station 189 feet, pool below toe of riffle						
Thalweg		103.29	11.01	92.28	1.31	93.59	
BM 1	3.29	103.29		100.00			Closure
BM 2		103.29	4.52	98.77			Closure, X-sections 1-3, 11-15

Project Number	200105
Stream	Stevens Creek
Location	McClellan Ranch, Steep McClellan
Date	11/30/00
Time	1545-1730
Length of Reach Measured (feet)	161.00
Length of Riffle (feet)	53.60
Q measured (cfs)	2.30

Comments for Reach

Sunny and cool (10 degrees celcius)

Visual Estimates: D50-medium pebbles, 10-20% embedded, bed covered in algae

Visual Estimate of Flow: 3-4 cfs

Most flow through right 1/5 of riffle

Slope %	0.026
Avg. Riffle Width (feet)	17.2

Station	BS	HI	FS	Elevation (feet)	Water Depth (feet)	Water Surface Elevation	Comments
Station Location	longitudinal station 5 feet, pool at head of riffle						
BM 1	5.03	105.03		100.00			RE of XS-3
BM 2		105.03	4.57	100.46			LE of XS-4
1-1'							
Thalweg		105.03	7.66	97.37	0.39	97.76	
Station Location	longitudinal station 14 feet, pool at head of riffle						
2-2'							
Thalweg		105.03	9.95	95.08	2.64	97.72	
Station Location	longitudinal station 22 feet, pool at head of riffle						
3-3'							
Thalweg		105.03	10.51	94.52	3.19	97.71	
Station Location	longitudinal station 32 feet, pool at head of riffle						
4-4'							
Thalweg		105.03	9.43	95.60	2.12	97.72	
Station Location	longitudinal station 41 feet, pool at head of riffle						
5-5'							
2.9		105.03	7.32	97.71	0	97.71	LEW
6.0		105.03	8.18	96.85	0.87	97.72	
9.0		105.03	8.19	96.84	0.89	97.73	gravels
12.0		105.03	8.28	96.75	0.98	97.73	
15.0		105.03	8.39	96.64	1.10	97.74	
18.0		105 03	7.97	97.06	0.66	97.72	
21.6		105.03	7.34	97.69	0.03	97.72	REW
Station Location	longitudinal station 51.4 feet, crest of riffle						
6-6'							
Thalweg		105.03	7.94	97.09	0.66	97.75	

Station Location longitudinal station 58 feet, top of riffle

7-7'						
0.0	105.03	4.56	100.47			LE top of pin
0.0	105.03	5.02	100.01			LE base of pin
1.9	105.03	5.65	99.38			top of bank, rootmass
2.6	105.03	7.65	97.38	0.06	97.44	LEW, base of bank
4.0	105.03	7.91	97.12	0.34	97.46	
6.8	105.03	7.58	97.45	0.00	97.45	top of rip rap
10.0	105.03	8.85	96.18	0.44	96.62	amongst gravels and small cobbles
12.0	105.03	8.94	96.09	0.50	96.59	behind cobble
15.0	105.03	7.55	97.48	0.15	97.63	on piece of rip rap
18.0	105.03	8.04	96.99	0.64	97.63	cobbles
21.4	105.03	7.40	97.63	0.00	97.63	REW
24.0	105.03	6.61	98.42			gravel covered bank, sand underneth
27.3	105.03	5.13	99.90			RE base of pin
27.3	105.03	4.82	100.21			RE top of pin

Station Location longitudinal station 70.6 feet, middle of riffle

8-8'						
0.0	105.03	4.42	100.61			LE top of nail
0.0	105.03	4.81	100.22			LE bottom of pin
1.4	105.03	5.99	99.04			top of bank, elderberry root mass
2.0	105.03	7.92	97.11	0.00	97.11	LEW, base of bank
4.0	105.03	8.33	96.70	0.45	97.15	amongst gravels
6.0	105.03	8.17	96.86	0.27	97.13	on rip rap
8.0	105.03	8.33	96.70	0.46	97.16	
10.0	105.03	8.20	96.83	0.31	97.14	behind boulder
12.0	105.03	8.07	96.96	0.22	97.18	in riffle
14.0	105.03	7.74	97.29	0.00	97.29	on cobble
16.0	105.03	8.22	96.81	0.52	97.33	gravels
18.0	105.03	8.01	97.02	0.29	97.31	
19.3	105.03	7.73	97.30	0.00	97.30	REW
20.6	105.03	6.96	98.07			top of bank
23.0	105.03	6.19	98.84			
25.4	105.03	5.31	99.72			RE base of pin
25.4	105.03	5.03	100.00			RE top of pin

Station Location longitudinal station 94.2 feet, toe of riffle, riffle extends to 105 feet

9-9'						
0.0	105.03	4.57	100.46			LE top of nail
0.0	105.03	5.11	99.92			LE bottom of pin
1.6	105.03	7.09	97.94			top of bank
3.4	105.03	8.68	96.35	0.27	96.62	LEW, base of bank, root wad
5.0	105.03	8.91	96.12	0.49	96.61	amongst large gravels
7.0	105.03	8.69	96.34	0.26	96.60	behind ripr ap
9.0	105.03	8.75	96.28	0.42	96.70	
11.0	105.03	8.87	96.16	0.47	96.63	large gravels
13.0	105.03	8.75	96.28	0.37	96.65	
15.0	105.03	8.44	96.59	0.10	96.69	on cobble
17.3	105.03	8.37	96.66	0.00	96.66	REW
19.0	105.03	7.56	97.47			gravel covered bank, sand beneath
21.3	105.03	6.64	98.39			below fallen tree

23.6		105.03		105.03			RE unable to sight
Station Location	longitudinal station 112.5 feet, pool below riffle						
10-10'							
1.0		105.03	9.24	95.79	0.76	96.55	LEW
3.0		105.03	9.20	95.83	0.72	96.55	
5.0		105.03	9.24	95.79	0.75	96.54	gravels
7.0		105.03	9.20	95.83	0.73	96.56	
9.0		105.03	9.21	95.82	0.74	96.56	
11.0		105.03	8.89	96.14	0.43	96.57	
14.1		105.03	8.44	96.59	0	96.59	REW
Station Location	longitudinal station 128 feet, pool below riffle						
11-11'							
Thalweg		105.03	9.2	95.83	0.67	96.5	
Station Location	longitudinal station 147 feet, pool below riffle						
12-12'							
Thalweg		105.03	9.76	95.27	1.23	96.50	
Station Location	longitudinal station 161 feet, pool below riffle						
13-13'							
Thalweg		105.03	10.57	94.46	2	96.46	
BM 1	5.03	105.03		100.00			Closure
BM 2		105.03	4.6	100.46			Closure

Project Number	200105
Stream	Stevens Creek
Location	Homestead Road (Rosgen Reach)
Date	11/21/00
Time	730-1030
Length of Reach Measured (feet)	74.30
Length of Riffle (feet)	51.00
Q measured (cfs)	2.30

Comments for Reach

Rainy and cold, light rain continued for most of the morning

Stream bed mixed with gravels and cobbles with some large clasts from bank stabilization
Visual estimate of flow: 2-3 cfs

Visual estimate of embeddedness: 20-30 % by very coarse sand

Slope (%)	0.022
Avg. Riffle Width (feet)	21.2

Station	BS	HI	FS	Elevation (feet)	Water Depth (feet)	Water Surface Elevation	Comments
Station Location	longitudinal station 6.3						
BM 1	4.53	104.53		100.00			table top boulder upstream of upstream most root wad
BM 2		104.53	4.82	99.71			top of spike near base of tree(?) on left bank
1-1'							
8.2		104.53	9.06	95.47	0.00	95.47	LEW
10.0		104.53	9.37	95.16	0.33	95.49	gravel
12.0		104.53	9.41	95.12	0.34	95.46	"
14.0		104.53	9.34	95.19	0.30	95.49	gravel and very coarse sand
16.0		104.53	9.15	95.38	0.12	95.50	on cobble
18.0		104.53	9.35	95.18	0.36	95.54	very coarse sand
20.0		104.53	9.80	94.73	0.75	95.48	large gravel
22.0		104.53	10.05	94.48	1.02	95.50	pocket of very coarse sand
24.0		104.53	10.06	94.47	1.00	95.47	on cobble
26.2		104.53	9.07	95.46	0.00	95.46	REW-on boulder-boulders continue to a height of seven feet stabilizing the bank
Station Location	longitudinal station 18 feet, crest of riffle						
16.7		104.53	9.42	95.11	0.34	95.45	on cobbles in middle of riffle
19.4		104.53	9.43	95.10	0.37	95.47	
Station Location	longitudinal station 24.4 feet, below crest of riffle						
2-2'							
0.0		104.53	4.82	99.71			LE top of pin (BM 2) bank covered by thin layer of cobbles and gravel, sand depostis under coarse deposits
0.0		104.53	5.18	99.35			LE bottom of pin
3.0		104.53	6.23	98.30			moving down bank covered by elderberries(?) and leaves
6.0		104.53	7.29	97.24			
7.4		104.53	7.72	96.81			top of bank supported by roots
8.1		104.53	9.31	95.22	0 00	95.22	LEW

10.0	104.53	9.66	94.87	0.36	95.23	gravels
12.0	104.53	9.58	94.95	0.25	95.20	on cobble
14.0	104.53	9.95	94.58	0.64	95.22	very coarse sand
16.0	104.53	9.21	95.32	0.00	95.32	on rip rap
18.0	104.53	8.99	95.54	0.00	95.54	"
20.0	104.53	9.41	95.12	0.23	95.35	
22.0	104.53	9.42	95.11	0.25	95.36	amongst cobbles
24.0	104.53	9.11	95.42	0.00	95.42	on cobble
26.0	104.53	9.41	95.12	0.26	95.38	cobbles
28.0	104.53	9.08	95.45	0.00	95.45	on cobble
29.8	104.53	9.04	95.49	0.00	95.49	REW
32.0	104.53	7.96	96.57			on boulder
34.0	104.53	5.5	99.03			on boulder
36.0	104.53	3.32	101.21			RE point on boulder below oak
Station Location	longitudinal station 44.6 feet, middle of riffle					
3-3'						
0.0	104.53	6.70	97.83			LE top of pin
0.0	104.53	7.05	97.48			LE base of pin
2.0	104.53	7.36	97.17			
4.0	104.53	8.01	96.52			
4.8	104.53	8.69	95.84			top of bank
5.6	104.53	10.04	94.49	0.38	94.87	LEW
8.0	104.53	9.81	94.72	0.18	94.90	on cobble
10.0	104.53	10.16	94.37	0.56	94.93	amongst cobbles
12.0	104.53	10.19	94.34	0.55	94.89	"
14.0	104.53	9.68	94.85	0.08	94.93	on cobble
16.0	104.53	9.88	94.65	0.30	94.95	"
18.0	104.53	9.74	94.79	0.19	94.98	on gravels
20.0	104.53	9.68	94.85	0.15	95.00	"
22.0	104.53	9.20	95.33	0.00	95.33	on cobbles
24.0	104.53	9.74	94.79	0.22	95.01	w/in small riffle structure
26.0	104.53	9.91	94.62	0.40	95.02	"
27.4	104.53	9.84	94.69	0.30	94.99	REW-below boulder
27.8	104.53	6.80	97.73			on boulder suppoting bank
30.6	104.53	5.66	98.87			base of boulder
32.2	104.53	2.47	102.06			RE point on boulder
Station Location	longitudinal station 59.5 feet, toe of riffle					
4-4'						
0.0	104.53	6.7	97.83			LE top of pin
0.0	104.53	7.11	97 42			LE base of pin
2.0	104.53	7.28	97.25			elderberries and leave coverd bank ~20 degrees
4.0	104.53	7.76	96.77			"
5.0	104.53	8.4	96.13			"
6.2	104.53	9.62	94.91			base of bank
8.4	104.53	9.85	94.68			upper end of bar
9.2	104.53	9.99	94.54	0.00	94.54	LEW

10.5		104.53	9.85	94.68	0.00	94.68	on cobble
12.0		104.53	10.33	94.20	0.39	94.59	
13.5		104.53	10.4	94.13	0.41	94.54	
15.0		104.53	10.44	94.09	0.39	94.48	cobbles
16.5		104.53	10.25	94.28	0.14	94.42	gravels
18.0		104.53	10.03	94.50	0.00	94.50	on cobble
19.5		104.53	10.13	94.40	0.08	94.48	gravels
21.0		104.53	10.05	94.48	0.00	94.48	on gravels
22.5		104.53	10.08	94.45	0.00	94.45	base of small step
24.0		104.53	9.94	94.59	0.00	94.59	gravels
25.1		104.53	9.94	94.59	0.00	94.59	REW
26.3		104.53	9.67	94.86			base of bank-bank compose of dirt and gravel
27.0		104.53	7.58	96.95			top of bank
28.0		104.53	6.9	97.63			
30.0		104.53	5.87	98.66			base of boulder
30.1		104.53	4.54	99.99			RE (BM 1)
Station Location	longitudinal station 74.3 feet, pool below toe of riffle						
5-5'							
6.0		104.53	10.67	93.86	0.00	93.86	LEW
8.5		104.53	11.04	93.49	0.39	93.88	
11.0		104.53	11.37	93.16	0.72	93.88	coarse sand
13.0		104.53	11.53	93.00	0.86	93.86	next to boulder
15.0		104.53	11.44	93.09	0.82	93.91	on flat boulder
17.2		104.53	10.84	93.69	0.15	93.84	REW base of root wad bank
BM 1	4.54	104.53		99.99			Closure
BM 2		104.53	4.82	99.71			Closure

Project Number	200105
Stream	Stevens Creek
Location	Fremont Road Bridge
Date	11/21/00
Time	1200-1600
Length of Reach Measured (feet)	200.00
Length of Riffle (feet)	175.50
Q measured (cfs)	2.22
Avg. Riffle Width (feet)	-

Comments for Reach

Rainy and cold

Large crawfish in pool above riffle-many small (1-2") fish in right hand pool and ab

Water became murky after onset of rain

Bed covered with algae, embeddedness ranges from 20-40%

1330: discharge from upstream bridge culvert is murky and causing foam to accun

in the channel below the culvert

Slope % 0.016

Station	BS	HI	FS	Elevation (feet)	Water Depth (feet)	Water Surface Elevation	Comments
Station Location	longitudinal station 17.96, pool at head of riffle						
BM 1	2.13	102.13		100.00			top of spike-base of oak tree
BM 2		102.13	4.91	97.22			top of spike-base of oak tree d/s of bridge on left bank
1-1'							
6.5		102.13	4.32	97.81			top of bank
7.6		102.13	4.87	97.26			base of bank
12.6		102.13	4.96	97.17	0.00	97.17	LEW-gravel bar
17.0		102.13	5.19	96.94	0.23	97.17	gravels
22.0		102.13	5.39	96.74	0.44	97.18	
26.0		102.13	5.70	96.43	0.75	97.18	cobbles
28.5		102.13	5.98	96.15	1.04	97.19	
32.8		102.13	6.74	95 39	0.80	96.19	
34.0		102.13	4.95	97.18	0.00	97.18	REW
Station Location	longitudinal station 20.9 feet, head of riffle and through riffle structure on right hand side of channel						
2-2'							
0.0		102.13	2.12	100.01			LE top of pin
0.0		102.13	2.37	99.76			LE bottom of pin
3.0		102.13	3.43	98.70			sandy bank
6.0		102.13	4.17	97.96			top of bank
7.1		102.13	4.98	97.15			base of bank
10.8		102.13	4.97	97.16	0.00	97.16	LEW
12.0		102.13	5.01	97.12	0.02	97.14	gravels
14.0		102.13	5.12	97.01	0.16	97.17	gravels
16.0		102.13	5.15	96.98	0.20	97.18	"
18.0		102.13	5.33	96.80	0.38	97.18	gravels, thalweg
20.0		102.13	5.10	97.03	0.27	97.30	cobbles and gravels
22.0		102.13	5.22	96.91	0.28	97.19	"
24.0		102.13	5.41	96.72	0.49	97.21	"
26.8		102.13	5.00	97.13	0.00	97.13	secondary riffle crest
28.0		102.13	5.11	97.02	0.04	97.06	on cobble

30.0	102.13	5.60	96.53	0.18	96.71	base of riffle crest
32.0	102.13	5.72	96.41	0.25	96.66	cobble/gravel bar
34.0	102.13	5.92	96.21	0.20	96.41	"
36.0	102.13	5.97	96.16	0.25	96.41	"
38.0	102.13	6.02	96.11	0.17	96.28	"
40.0	102.13	6.23	95.90	0.21	96.11	"
42.3	102.13	6.76	95.37	0.40	95.77	edge of bar
43.8	102.13	7.17	94.96	0.79	95.75	
44.8	102.13	7.07	95.06	0.70	95.76	LE concrete platform
45.0	102.13	6.07	96.06			concrete sack
46.0	102.13	5.48	96.65			RE concrete platform at upper edge of bridge
Station Location	longitudinal station 56.2 feet, middle of riffle					
3-3'						
0.0	102.13	3.84	98.29			LE top of pin
0.0	102.13	3.95	98.18			LE base of pin
2.0	102.13	4.36	97.77			sandy bank
3.2	102.13	4.74	97.39			top of bank
4.0	102.13	5.75	96.38	0.31	96.69	LEW left braid, base of bank
5.5	102.13	5.82	96.31	0.33	96.64	cobble and gravel
7.0	102.13	5.80	96.33	0.32	96.65	"
8.5	102.13	5.68	96.45	0.20	96.65	"
10.0	102.13	5.54	96.59	0.08	96.67	
11.4	102.13	5.44	96.69	0.00	96.69	REW, LE of gravel/cobble bar
13.0	102.13	5.15	96.98			
15.0	102.13	4.99	97.14			gravel
17.0	102.13	4.86	97.27			"
19.0	102.13	4.70	97.43			"
21.0	102.13	4.74	97.39			"
23.0	102.13	4.97	97.16			" and small cobbles
25.0	102.13	5.08	97.05			"
27.0	102.13	5.39	96.74			"
29.0	102.13	5.47	96.66			"
31.0	102.13	5.55	96.58			"
33.0	102.13	5.60	96.53			on cobble
35.0	102.13	5.91	96.22			gravel
37.0	102.13	6.37	95.76			"
39.0	102.13	6.51	95.62			on cobble
39.8	102.13	6.65	95.48	0.00	95.62	LEW
41.0	102.13	6.93	95.20	0.29	95.77	
42.0	102.13	6.98	95.15	0.32	95.52	gravel
43.0	102.13	6.76	95.37	0.10	95.25	on cobble
44.0	102.13	6.83	95.30	0.20	95.57	gravel
45.2	102.13	6.84	95.29	0.19	95.49	REW
45.4	102.13	5.89	96.24			concrete platform
46.0	102.13	5.49	96.64			RE
Station Location	longitudinal station 115.5 feet, middle of riffle					
4.4'						
0.0	102.13	1.03	101.10			LE top of pin
0.0	102.13	1.49	100.64			LE base of pin
2.0	102.13	2.02	100.11			bare soil covered slope

5.0	102.13	2.91	99.22			" 6.8-8.3 bridge pier
7.0	102.13	3.45	98.68			"
10.5	102.13	4.59	97.54			top of bank
11.5	102.13	5.67	96.46			bank slop
12.0	102.13	6.40	95.73	0.24	95.97	LEW
13.4	102.13	6.87	95.26	0.70	95.96	
15.0	102.13	6.65	95.48	0.48	95.96	gravels
16.5	102.13	6.41	95.72	0.22	95.94	"
18.0	102.13	6.30	95.83	0.10	95.93	"
19.6	102.13	6.19	95.94	0.00	95.94	REW, edge of bar
21.0	102.13	5.64	96.49			bar slope
22.6	102.13	5.06	97.07			top of gravel bar
25.0	102.13	5.21	96.71			gravel
28.0	102.13	5.42	96.39			"
30.6	102.13	5.74	95.48			RE of bar
33.0	102.13	6.65	94.93	0.00	94.93	LEW
35.0	102.13	7.20	94.67	0.52	95.19	gravels
37.0	102.13	7.46	94.48	0.80	95.28	"
39.0	102.13	7.65	94.48	1.00	95.48	on cobble
41.0	102.13	7.85	94.28	1.20	95.48	cobbles
43.0	102.13	7.74	94.39	1.08	95.47	gravels
45.0	102.13	7.45	94.68	0.80	95.48	
45.3	102.13	6.66	95.47	0.00	95.47	REW
47.0	102.13	6.31	95.82			gravel and cobble bank
49.0	102.13	5.49	96.64			
51.0	102.13	4.91	97.22			cobbled slope
53.0	102.13	3.86	98.27			"
54.7	102.13	2.55	99.58			RE base of pin
54.7	102.13	2.07	100.06			RE top of pin
Station Location	longitudinal station 156.9 feet, toe of riffle					
5.5'						
0.0	102.13	4.91	97.22			LE top of pin
0.0	102.13	5.13	97.00			LE base of pin
2.0	102.13	6.13	96.00			sandy surface
4.0	102.13	6.64	95.49			" edge of gravel
6.0	102.13	6.82	95.31			gravels
8.0	102.13	6.93	95.20			"
9.2	102.13	6.98	95.15	0.00	95.15	LEW
11.0	102.13	7.09	95.04	0.15	95.19	gravel
13.0	102.13	7.29	94.84	0.39	95.23	"
15.0	102.13	7.31	94.82	0.38	95.20	"
17.0	102.13	7.18	94.95	0.30	95.25	"
19.0	102.13	7.19	94.94	0.28	95.22	"
21.0	102.13	6.87	95.26	0.00	95.26	on small cobble
23.0	102.13	7.08	95.05	0.20	95.25	gravels
25.4	102.13	6.87	95.26	0.00	95.26	REW
27.0	102.13	6.51	95.62			gravels and small cobbles
29.0	102.13	5.84	96.29			gravels
31.5	102.13	5.1	97.03			~ bankfull surface
33.0	102.13	4.39	97.74			sandy surface
34.4	102.13	3.52	98.61			RE base of pin

34.4		102.13	3.11	99.02			RE top of pin
Station Location	longitudinal station 190.5 feet, toe of riffle						
6-6'							
0.0		102.13	4.76	97.37			LE top of pin
0.8		102.13	7.61	94.52			base of cut bank
1.6		102.13	8.37	93.76	0.31	94.07	LEW
3.0		102.13	8.52	93.61	0.44	94.05	gravels
4.0		102.13	8.50	93.63	0.39	94.02	" ~ 50% embedded
5.0		102.13	8.48	93.65	0.41	94.06	gravels
6.0		102.13	8.45	93.68	0.38	94.06	gravels and coarse sand
7.0		102.13	8.25	93.88	0.15	94.03	"
7.8		102.13	8.06	94.07	0.00	94.07	REW
9.0		102.13	7.77	94.36			gravel bar
11.0		102.13	7.43	94.7			on cobble
13.0		102.13	7.44	94.69			gravels and cobbles
15.0		102.13	7.27	94.86			gravels with coarse sand in between gravels
17.0		102.13	6.99	95.14			gravels
19.0		102.13	6.39	95.74			gravel bank
21.0		102.13	5.74	96.39			
24.0		102.13	4.87	97.26			RE base of pin
24.0		102.13	4.47	97.66			RE top of pin
Station Location	longitudinal station 200 feet, pool below toe of riffle						
7-7'							
1.8		102.13	8.57	93.56	0.31	93.87	LEW
3.8		102.13	8.99	93.14	0.7	93.84	
4.8		102.13	8.9	93.23	0.58	93.81	
5.2		102.13	8.8	93.33	0.48	93.81	
7		102.13	8.82	93.31	0.51	93.82	
10.2		102.13					REW unable to site b/c of thick vegetation
BM 1	2.13	102.13		100.00			Closure
BM 2		102.13	4.90	97.23			Closure

APPENDIX B

Project Number 200105
Stream Coytoe Creek
Location Coyote 1: intersection of malaguerra and cochrane
Date 01/17/01
Time 7:30 a.m. - 12:30 p.m.
Length of Reach Measured (feet) 234 feet
Length of Riffle (feet) 111 feet
Q measured (cfs) 25.50

Comments for Reach
Clear skies and cold temperatures
Water slightly milky in color
Bed material: medium pebbles to large cobbles covered in algae, 10
Last rains 7-10 days ago

Average Riffle Width (feet): 30.4
Riffle Slope (%) 0.010

Station	BS	HI	FS	Elevation (feet)	Water Depth (feet)	Water Surface Elevation	Comments
Station Location	longitudinal station 0, pool at head of riffle						
BM 1	4.08	104.08		100.00			
BM 2		104.08	3.19	100.89			
1-1'							
2.0		104.08	3.15	100.93			top of bank
7.5		104.08	4.64	99.44	0.00	99.44	LEW
15.0		104.08	7.99	96.09	3.30	99.39	Thalweg
32.6		104.08	4.70	99.38	0.00	99.38	REW
40.0		104.08	2.61	101.47			top of bank
Station Location	longitudinal station 19.4 feet, pool at head of riffle						
2-2'							
0.0		104.08	3.21	100.87			top of bank
5.9		104.08	4.60	99.48	0.00	99.48	LEW
14.4		104.08	8.06	96.02	3.40	99.42	Thalweg
32.0		104.08	4.68	99.40	0.00	99.40	REW
39 5		104.08	2.75	101.33			top of bank
Station Location	longitudinal station 41.9 feet, toe of pool						
3-3'							
3.0		104.08	3.76	100.32			top of bank
9.4		104.08	4.72	99.36	0.00	99.36	LEW
12.0		104.08	5.17	98.91	0.48	99.39	
15.0		104.08	5.82	98.26	1.03	99.29	
18.0		104.08	6.03	98.05	1.24	99.29	
21.0		104.08	6.13	97.95	1.38	99.33	
24.0		104.08	5.98	98.10	1.29	99.39	
27.0		104.08	5.96	98.12	1.27	99.39	
33.1		104 08	4.67	99.41	0.00	99.41	REW
37.5		104.08	4.01	100.07			top of bank
Station Location	longitudinal station 59.2 feet, head of riffle						**First monumented cross-section**
4.4'							
0.00		104.08	3 20	100.88			LE XS-4 top of pin

0.00	104.08	3.43	100.65			LE XS-4 bottom of pin
3.0	104.08	3.19	100.89			on gravel
6.0	104.08	3.37	100.71			
9.0	104.08	3.50	100.58			
12.0	104.08	3.94	100.14			edge of flat surface
15.2	104.08	4.85	99.23	0.00	99.23	LEW
18.0	104.08	5.31	98.77	0.48	99.25	bed consists of gravels and a few large cobbles
21.0	104.08	5.34	98.74	0.49	99.23	"
24.0	104.08	5.30	98.78	0.47	99.25	"
27.0	104.08	5.20	98.88	0.35	99.23	"
30.0	104.08	5.42	98.66	0.65	99.31	"
33.0	104.08	5.56	98.52	0.68	99.20	"
36.0	104.08	5.94	98.14	1.02	99.16	"
39.0	104.08	5.88	98.20	1.09	99.29	"
42.0	104.08	5.35	98.73	0.53	99.26	"
43.6	104.08	4.83	99.25	0.00	99.25	REW
47.0	104.08	4.31	99.77			channel bank
51.0	104.08	3.49	100.59			channel bank: cross-section ends at station 51.9
Station Location	longitudinal station 99.0 feet, middle of riffle					**Second monumented cross-section**
5.5'						
0.0	104.08	0.63	103.45			LE XS-5 top of pin
0.0	104.08	0.97	103.11			LE XS-5 bottom of pin
2.0	104.08	1.76	102.32			
4.0	104.08	4.55	99.53			
6.0	104.08	5.26	98.82	0.00	98.82	LEW
9.0	104.08	5.27	98.81	0.42	99.23	bed consists of gravels and a few large cobbles
12.0	104.08	5.83	98.25	0.63	98.88	"
15.0	104.08	6.00	98.08	0.80	98.88	"
18.0	104.08	6.07	98.01	0.87	98.88	"
21.0	104.08	6.00	98.08	0.81	98.89	"
24.0	104.08	5.80	98.28	0.57	98.85	"
27.0	104.08	5.79	98.29	0.60	98.89	"
30.0	104.08	5.69	98.39	0.49	98.88	"
33.0	104.08	5.66	98.42	0.51	98.93	"
36.0	104.08	5.42	98.66	0.20	98.86	"
39.0	104.08	5.52	98.56	0.31	98.87	"
41.7	104.08	5.23	98.85	0.00	98.85	REW
47.4	104.08	3.32	100.76			
53.0	104.08	3.39	100.69			RE XS-5 top of pin
53.0	104.08	3.06	101.02			RE XS-5 bottom of pin
Station Location	longitudinal station 141.1 feet, toe of riffle					**Third monumented cross-section**
6-6'						
0.0	104.08	3.83	100.25			LE XS-6 top of pin
0.0	104.08	4.04	100.04			LE XS-6 bottom of pin
2.0	104.08	4.91	99.17			
4.7	104.08	5.65	98.43	0.00	98.43	LEW
7.0	104.08	6.52	97.56	0.9	98.46	bed consists of gravels and a few large cobbles
9.0	104.08	6.52	97.56	0.89	98.45	"
11.0	104.08	6.57	97.51	0.9	98.41	"
13.0	104.08	6.49	97.59	0.82	98.41	"

15.0		104.08	6.41	97.67	0.79	98.46	"
17.0		104.08	6.25	97.83	0.48	98.31	"
19.0		104.08	6.08	98.00	0.49	98.49	"
21.0		104.08	5.95	98.13	0 38	98.51	"
23.0		104.08	6.11	97.97	0.52	98.49	"
25.0		104.08	5.90	98.18	0.31	98.49	"
28.5		104.08	5.54	98.54	0.00	98.54	REW
33.0		104.08	4.91	99.17			
39.0		104.08	4.55	99.53			flat surface covered with brambles
43.6		104.08	3.90	100.18			RE XS-5 top of pin
43.6		104.08	3.55	100.53			RE XS-5 bottom of pin
Station Location	longitudinal station 170.8 feet, pool below toe of riffle						
7-7'							
2.0		104.08	4.90	99.18			
4.2		104.08	5.91	98.17	0.00	98.17	LEW
7.0		104 08	7.03	97.05	1.14	98.19	
9.0		104.08	7.09	96.99	1.22	98.21	
11.0		104.08	6.94	97.14	1.11	98.25	
13.0		104.08	6.92	97.16	1.05	98.21	
15.0		104.08	6.76	97.32	0.89	98.21	
17.0		104.08	6.71	97.37	0.81	98.18	
19.0		104.08	6.30	97.78	0.40	98.18	
22.0		104.08	6.94	97.14	0.00	97.14	REW
27.0		104 08	5.35	98.73			
30.0		104.08	5.30	98.78			
Station Location	longitudinal station 234.5 feet, pool below toe of riffle						
8-8'							
2.0		104.08	4.01	100.07			
3.6		104.08		104.08			LEW: cannot see due to tree branches
8.2		104.08	7.44	96.64	1.30	97.94	
13.0		104.08	7.25	96.83	1.22	98.05	
17.0		104.08	6.95	97.13	0.84	97.97	
24.0		104.08	6.51	97.57	0.38	97.95	
30.8		104.08	6.13	97.95	0.00	97 95	REW
35.5		104.08	5.74	98.34			top of bank
BM 1	4.08	104.08		100.00			
BM 2		104.08	3 20	100.88			Closure

Project Number	200105
Stream	Coytoe Creek
Location	Coyote 2: roughly 0.2 miles downstream of Coyote 1
Date	01/17/01
Time	1:00 p.m. - 5:00 p.m.
Length of Reach Measured (feet)	299.00
Length of Riffle (feet)	92.20
Q measured (cfs)	25.50 Q measurement from Coyote 1

Comments for Reach

Clear skies and cold temperatures
Water slightly milky in color
Bed material: medium pebbles to large cobbles covered in algae, 1
Last rains 7-10 days ago

Average Riffle Width (feet):	20.6
Riffle Slope (%)	0.023

Station	BS	HI	FS	Elevation (feet)	Water Depth (feet)	Water Surface Elevation	Comments
Station Location	longitudinal station 11.0 feet, pool at head of riffle						
BM 1	4.35	104.35		100.00			LE XS-3
BM 2		104.35	3.75	100.60			Top of pin on right bank near RE XS-2
1-1'							
2		104.35	3.62	100.73	0.00	100.73	LEW
20		104.35	3.67	100.68	0.16	100.84	
36		104.35	4.49	99.86	0.98	100.84	
40		104.35	5.06	99.29	1.55	100.84	
48		104.35	3.50	100.85	0.00	100.85	REW
Station Location	longitudinal station 54.8 feet, short riffle section separated from larger riffle structure further downstream						
2-2'							**First monumented x-section**
0.0							LE XS-2: cannot site due to tree
2.0		104.35	3.89	100.46	0.00	100.46	LEW
6.0		104.35	5.15	99.20	1.30	100.50	bed consists of gravels and small cobbles with algae
10.0		104.35	5.01	99.34	1.08	100.42	"
14.0		104.35	4.56	99.79	0.60	100.39	"
18.0		104.35	4.36	99.99	0.59	100.58	"
22.0		104.35	4.24	100.11	0.60	100.71	"
26.0		104.35	4.24	100.11	0.61	100.72	"
30.0		104.35	4.55	99.80	0.94	100.74	"
34.0		104.35	4.08	100.27	0.85	101.12	"
38.0		104.35	4.25	100.10	0.73	100.83	"
42.0		104.35	4.34	100.01	0.82	100.83	"
48.0		104.35	3.51	100.84	0.00	100.84	REW
51.0		104.35	2.93	101.42			Bottom of pin RE XS-2
51.0		104.35	2.72	101.63			Top of pin RE XS-3
Station Location	longitudinal station 91.4 feet, pool at head of riffle						
3-3'							
1.0		104.35	2.92	101.43			Top of root
1.7		104.35	4.02	100.33	0.00	100.33	LEW
2.0		104.35	5.92	98.43	1.91	100.34	
5.0		104.35	6.03	98.32	2.01	100.33	
7.0		104.35	6.15	98.20	2.19	100.39	

9.0	104.35	5.99	98.36	2.01	100.37	
11.0	104.35	5.78	98.57	1.78	100.35	
13.0	104.35	5.44	98.91	1.43	100.34	
15.0	104.35	4.92	99.43	0.92	100.35	
19.0	104.35	4.70	99.65	0.71	100.36	
23.0	104.35	4.25	100.10	0.25	100.35	
30.0	104.35	3.89	100.46	0.13	100.59	
33.0	104.35	4.06	100.29	0.24	100.53	
40.0	104.35	3.77	100.58	0.00	100.58	REW
42.5	104.35	3.64	100.71			Top of bank
Station Location	longitudinal station 147 feet, head of riffle, x-section 2'-2' in field notes					XS 2-2' in field notes, same Q as coyote 1 up to this point, elevation of channel x-section drops from left to right through riffle structure
4-4'						**Second monumented x-section**
0	104.35	2.00	102.35			LE XS-4 top of pin
0	104.35	2.04	102.31			LE XS-4 bottom of pin
2	104.35	3.39	100.96			channel bank
3.8	104.35	4.04	100.31	0.00	100.31	LEW
6	104.35	4.85	99.50	0.80	100.30	bed consists of gravels and small cobbles with algae
9	104.35	4.99	99.36	0.95	100.31	"
12	104.35	4.90	99.45	0.85	100.30	"
15	104.35	4.81	99.54	0.76	100.30	"
18	104.35	4.89	99.46	0.81	100.27	"
21	104.35	4.71	99.64	0.62	100.26	"
24	104.35	4.72	99.63	0.61	100.24	"
27	104.35	4.96	99.39	0.83	100.22	"
31	104.35	4.65	99.70	0.46	100.16	"
34	104.35	4.61	99.74	0.32	100.06	"
38	104.35	4.76	99.59	0.27	99.86	"
42	104.35	5.05	99.30	0.28	99.58	"
46	104.35	5.63	98.72	0.49	99.21	"
49	104.35	5.71	98.64	0.56	99.20	"
52	104.35	5.60	98.75	0.22	98.97	"
55	104.35	5.98	98.37	0.46	98.83	"
57.8	104.35	5.67	98.68	0.00	98.68	REW
62	104.35	4.89	99.46			
71.2	104.35	3.92	100.43			RE XS-4 bottom of pin
71.2	104.35	3.75	100.60			RE XS-4 top of pin
Station Location	longitudinal station 159 feet, head of riffle, x-section 2-2 in field notes					**Third monumented x-section**
5-5'						
0.0	104.35	4.47	99.88			LE XS-5 top of pin
0.0	104.35	4.70	99.65			LE XS-5 bottom of pin
3.0	104.35	4.75	99.60			toe of steep bank
6.0	104.35	5.14	99.21			toe of steep bank
8.0	104.35	5.49	98.86	0.00	98.86	LEW
10.0	104.35	6.09	98.26	0.65	98.91	bed consists of large gravels and large cobbles
12.0	104.35	6.29	98.06	0.72	98.78	"
14.0	104.35	6.20	98.15	0.64	98.79	"
16.0	104.35	6.30	98.05	0.65	98.70	"

18.0	104.35	6.17	98.18	0.51	98.69	"
20.0	104.35	5.94	98.41	0.26	98.67	"
22.0	104.35	6.23	98.12	0.52	98.64	"
24.0	104.35	6.56	97.79	0.87	98.66	"
26.0	104.35	6.57	97.78	0.89	98.67	"
28.0	104.35	6.33	98.02	0.68	98.70	"
30.0	104.35	5.71	98.64	0.00	98.64	REW
32.0	104.35	5.02	99.33			channel bank: grasses
36.0	104.35	4.51	99.84			grasses
40.0	104.35	4.31	100.04			grasses
43.7	104.35	3.92	100.43			RE XS-5 bottom of pin
43.7	104.35	3.75	100.60			RE XS-5 top of pin
Station Location	longitudinal station 215.4 feet, middle of riffle					**Fourth monumented x-section**
6-6'						
0.0	104.35	4.35	100.00			LE XS-6 top of pin
0.0	104.35	4.72	99.63			LE XS-6 bottom of pin
3.0	104.35	4.86	99.49			
6.0	104.35	6.25	98.10			
11.0	104.35	6.31	98.04			base of bank
11.6	104.35	6.44	97.91	0.00	97.91	LEW
14.0	104.35	6.61	97.74	0.15	97.89	bed consists of large gravels and large cobbles
16.0	104.35	6.79	97.56	0.30	97.86	"
18.0	104.35	7.11	97.24	0.62	97.86	"
20.0	104.35	7.28	97.07	0.80	97.87	"
22.0	104.35	7.26	97.09	0.77	97.86	"
24.0	104.35	7.57	96.78	0.84	97.62	"
26.0	104.35	7.77	96.58	1.31	97.89	"
28.0	104.35	7.58	96.77	1.12	97.89	"
30.9	104 35	6.61	97.74	0.00	97.74	REW
34.0	104.35	6.00	98.35			
37.1	104.35	4.63	99.72			RE XS-6 bottom of pin
37.1	104.35	4.21	100.14			RE XS-6 top of pin
Station Location	longitudinal station 246.8 feet, middle of riffle					**Fifth monumented x-section**
7-7'						
0.0	104.35	4.41	99.94			LE XS-7 top of pin
0.0	104.35	4.84	99.51			LE XS-7 bottom of pin
3.0	104.35	4.88	99.47			channel bank
6.0	104.35	6.15	98.20			channel bank
8.0	104.35	6.88	97.47	0.00	96 95	LEW
10.0	104.35	7.4	96.95	0.50	97.48	bed consists of large gravels and large cobbles
12.0	104.35	7.37	96.98	0.49	97.38	"
14.0	104.35	7.46	96.89	0.58	97.04	"
16.0	104.35	7.89	96.46	0.83	97.16	"
18.0	104.35	8.02	96.33	1.15	97.64	"
20.0	104.35	7.86	96.49	1.02	97.46	"
22.0	104.35	7.91	96.44	0.99	97.72	"
24.0	104.35	7.62	96.73	0.79	97.90	"
26.0	104.35	7.24	97.11	0.33	97.73	"
28.0	104.35	6.95	97.40	0.00	98.15	REW
31.0	104.35	6.2	98.15			channel bank

34.0		104.35	5.58	98.77			channel bank
38.2		104.35	5.13	99.22			RE XS-7 bottom of pin
38.2		104.35	4.82	99.53			RE XS-7 top of pin
Station Location	longitudinal station 268 feet, pool at toe of riffle						
8-8'							
5.0		104.35	6.62	97.73			channel bank
8.0		104.35	7.17	97.18	0.00	97.18	LEW
10.0		104 35	7.61	96.74	0.25	96.99	
12.0		104.35	7.9	96.45	0.42	96.87	
14.0		104.35	7.97	96.38	0.54	96.92	
16.0		104.35	8.18	96.17	0.75	96.92	
18.0		104.35	8.39	95.96	1.01	96.97	
20.0		104.35	8.59	95.76	1.21	96.97	
22.0		104.35	8.68	95.67	1.22	96.89	
24.0		104.35	8.08	96.27	0.70	96.97	
26.0		104.35	8.16	96.19	0.69	96.88	
31.0		104.35	7.48	96.87	0.00	96.87	REW
33.0		104.35	5.92	98.43			channel bank
Station Location	longitudinal station 299 feet, pool below toe of riffle						
9-9'							
6.5		104.35	6.45	97.90			channel bank
8.0		104.35	7.51	96.84	0.00	96.84	LEW
15.0		104.35	8.96	95.39	1.40	96.79	
20.0		104.35	9.41	94.94	1.95	96.89	
25.0		104.35	8.94	95.41	1.40	96.81	
28.0		104.35	8.35	96.00	0.88	96.88	
32.5		104.35	7.58	96.77	0.00	96.77	REW
38.0		104.35	5.72	98.63			channel bank
BM 1	4.36	104 35		99.99			Closure
BM 2		104.35	3.75	100.60			Closure

Project Number	200105
Stream	Coytoe Creek
Location	Coyote 3: roughly 1.5 miles downstream of Coyote 1
Date	01/18/01
Time	7:30 a.m. - 12:00 p.m.
Length of Reach Measured (feet)	310.00
Length of Riffle (feet)	101.00
Q measured (cfs)	24.60
Slope (%)	0.015

Comments for Reach

Clear skies and cold temperatures
Water slightly milky in color
Bed material: medium pebbles to large cobbles covered in algae, 10-2
Last rains 7-10 days ago

Large, wide riffle, appears stable with adjacent floodplain, oaks and b

Numerous bi-valve shells littered on the channel be and floodplain

Average Riffle Width (feet): 38.8

Station	BS	HI	FS	Elevation (feet)	Water Depth (feet)	Water Surface Elevation	Comments
SET-UP #1							
Station Location	longitudinal station 0 feet, pool at head of riffle						
BM 1	2.68	102.68		100.00			Top of pin on left bank, downstream of LE XS 2
BM 2		102.68	4.79	97.89			RE XS 3, top of pin
1-1'							
2.0		102.68	5.57	97.11	0.00	97.11	LEW
22.0		102.68	6.77	95 91	1.19	97.10	bed consists of fine gravels to coarse gravels, not imbedded
36.0		102.68	7.74	94.94	2.15	97.09	"
44.0		102.68	7.50	95.18	1.91	97.09	REW
45.0		102.68	4.93	97.75			top of bank
Station Location	longitudinal station 35 feet, pool at head of riffle						
2-2'							
2.0		102.68	5.59	97.09	0.00	97.09	LEW
20.0		102.68	6.14	96.54	0.53	97.07	bed consists of fine gravels to small cobbles, not imbedded
36.0		102.68	7.29	95.39	1.70	97.09	v. coarse sand between cobbles
46.0		102.68	7.43	95.25	1.84	97.09	
49.0		102.68	7.08	95.60	1.50	97.10	REW
51.0		102.68	4.56	98.12			Top of bank
Station Location	longitudinal station 73 feet, pool at head of riffle						
3-3'							
3.0		102.68	5.06	97.62			
6.0		102.68	5.60	97.08	0.00	97.08	LEW
9.0		102.68	6.34	96.34	0.70	97.04	
12.0		102.68	6.86	95.82	1.21	97.03	
15.0		102.68	6.86	95.82	1.23	97.05	
18.0		102.68	6.75	95.93	1.13	97.06	
21.0		102.68	6.75	95.93	1.14	97.07	
24.0		102.68	6.82	95.86	1.19	97.05	
27.0		102.68	6.56	96.12	0.96	97.08	

30.0	102.68	6.46	96.22	0.85	97.07	amongst LWD and boulder snag
33.0	102.68	6.82	95.86	1.20	97.06	
36.0	102.68	7.01	95.67	1.39	97.06	
39.0	102.68	6.69	95.99	1.09	97.08	
42.0	102.68	7.00	95.68	1.38	97.06	
47.0	102.68	5.78	96.90	0.91	97.81	in grasses
48.7	102.68	5.63	97.05	0.00	97.05	REW
52.0	102.68	4.65	98.03			channel bank
Station Location	longitudinal station 130 feet, head of riffle					**First monumented x-section**
4-4'						
0.0	102.68	4.22	98.46			LE XS-4 top of pin
0.0	102.68	4.54	98.14			LE XS-4 bottom of pin
3.0	102.68	5.05	97.63			
6.0	102.68	5.37	97.31			
9.6	102.68	5.83	96.85	0.00	96.85	LEW
12.0	102.68	6.13	96.55	0.36	96.91	bed consists of medium gravels to small cobbles
15.0	102.68	6.57	96.11	0.78	96.89	"
18.0	102.68	6.49	96.19	0.72	96.91	"
21.0	102.68	6.65	96.03	0.94	96.97	"
24.0	102.68	5.95	96.73	0.23	96.96	"
27.0	102.68	6.39	96.29	0.66	96.95	"
30.0	102.68	6.64	96.04	0.92	96.96	"
33.0	102.68	6.62	96.06	0.80	96.86	"
36.0	102.68	6.53	96.15	0.71	96.86	"
39.0	102.68	6.31	96.37	0.55	96.92	on large cobble
42.0	102.68	6.88	95.80	1.03	96.83	in fallen tree
45.0	102.68	6.61	96.07	0.78	96.85	in fallen tree
48.0	102.68	6.70	95.98	0.82	96.80	
52.0	102.68	5.94	96.74	0.10	96.84	REW
54.0	102.68	5.08	97.60			
57.2	102.68	4.96	97.72			RE XS-4 bottom of pin
57.2	102.68	4.65	98.03			RE XS-4 top of pin
Station Location	longitudinal station 200.4 feet, middle of riffle					**Second monumented cross-section**
5-5'						
1.0	102.68	4.78	97.90			LE XS-5 top of pin
1.0	102.68	5.08	97.60			LE XS-5 bottom of pin
3.0	102.68	5.35	97.33			approximate bankfull
6.0	102.68	6.32	96.36			
9.0	102.68	6.56	96.12	0.00	96.12	LEW
12.0	102.68	7.00	95.68	0.40	96.08	bed consists of cobbles and small boulders
15.0	102.68	6.96	95.72	0.40	96.12	"
18.0	102.68	7.16	95.52	0.56	96.08	"
21.0	102.68	7.26	95.42	0.69	96.11	"
24.0	102.68	7.27	95.41	0.65	96.06	"
27.0	102.68	7.43	95.25	0.89	96.14	"
30.0	102.68	7.16	95.52	0.60	96.12	"
33.0	102.68	7.46	95.22	0.93	96.15	"
36.0	102.68	6.91	95.77	0.35	96.12	"
39.0	102.68	7.61	95.07	0.95	96.02	"

42.0		102.68	6.55	96.13			on boulder
45.9		102.68	6.56	96.12	0.00	96.12	REW
50.0		102.68	5.88	96.80			channel bank
54.0		102.68	5.21	97.47			channel bank
58.6		102.68	4.00	98.68			RE XS-5 bottom of pin
58.6		102.68	3.82	98.86			RE XS-5 top of pin
Station Location	longitudinal station 231 feet, toe of riffle						**Third monumented cross-section**
6-6"							
0.0		102.68	4.55	98.13			LE XS-6 top of pin
0.0		102.68	4.68	98.00			LE XS-6 bottom of pin
5.0		102.68	5.67	97.01			
8.0		102.68	6.64	96.04			
10.5		102.68	7.33	95.35	0.00	95.35	LEW
14.0		102.68	7.81	94.87	0.42	95.29	
17.0		102.68	7.61	95.07	0.25	95.32	
20.0		102.68	7.68	95.00	0.35	95.35	
23.0		102.68	7.98	94.70	0.62	95.32	
26.0		102.68	7.96	94.72	0.65	95.37	
29.0		102.68	8.15	94.53	0.84	95.37	
32.0		102.68	8.21	94.47	0.91	95.38	
35.0		102.68	7.98	94.70	0.69	95.39	
38.0		102.68	7.86	94.82	0.62	95.44	
41.0		102.68	8.08	94.60	0.81	95.41	
44.0		102.68	8.04	94.64	0.73	95.37	
47.7		102.68	7.24	95.44	0.00	95.44	REW
51.0		102.68	6.06	96.62			channel bank
55.0		102.68	5.1	97.58			RE XS-6 bottom of pin
55.0		102.68	4.78	97.90			RE XS-6 top of pin
BM 1	2.68	102.68		100			Closure before new location

SET-UP #2

Station Location	longitudinal station 263.4 feet, pool below riffle						
TP 1	5.20	103.10		97.90			Top of pin, LE XS 2
TP 2		103.10	4.96	98.14			Top of pin, LE XS 3
7-7'							
12.0		103.10	7.14	95.96			Top of bank
13.4		103.10	8.23	94.87	0.00	94.87	LEW
15.0		103.10	9.33	93.77	1.09	94.86	
22.0		103.10	9.36	93.74	1.10	94.84	
26.0		103.10	9.45	93.65	1.21	94.86	
30.0		103.10	9.57	93.53	1.33	94.86	
34.0		103.10	9.86	93.24	1.61	94.85	
38.0		103.10	10.02	93.08	1.79	94.87	
42.0		103.10	10.12	92.98	1.94	94.92	
46.0		103.10	9.40	93.70	1.18	94.88	
48 1		103.10	8.18	94.92	0.00	94.92	REW
49.2		103.10	7.30	95.80			on bank
Station Location	longitudinal station 291 feet, pool below riffle						

8-8'							
8.0		103.10	7.36	95.74			on bank
9.6		103.10	8.26	94.84	0.00	94.84	LEW
12.0		103.10	9.52	93.58	1.28	94.86	
20.0		103.10	9.78	93.32	1.56	94.88	
28.0		103.10	10.79	92.31	2.57	94.88	
36.0		103.10	11.14	91.96	2.83	94.79	
40.7		103.10	8.25	94.85	0.00	94.85	REW
42.0		103.10	6.85	96.25			on bank
Station Location	longitudinal station 310 feet, pool below toe of riffle						
9-9'							
4.0		103.10	7.78	95.32			on bank
12.5		103.10	8.24	94.86	0.00	94.86	LEW
20.0		103.10	9.53	93.57	1.3	94.87	
26.0		103.10	10.67	92.43	2.46	94.89	
30.0		103.10	11.17	91.93	2.95	94.88	
36.0		103.10	11.14	91.96	2.83	94.79	
40.7		103.10	8.25	94.85	0.00	94.85	REW
42.0		103.10	6.85	96.25			on bank
TP 1	5.2	103.10		97.90			Closure
TP 2		103.10	4.97	98.13			Closure

Project Number	200105
Stream	Coytoe Creek
Location	Coyote 4: Santa Clara County Model Aeroplane Park
Date	01/26/01
Time	1:00 p.m. - 4:30 p.m.
Length of Reach Measured (feet)	210.00
Length of Riffle (feet)	112.00
Q measured (cfs)	15.80

Comments for Reach

Partly cloudy skies, cool temperatures (~55)

Water is clear

Bed material: gravels to cobbles covered in algae, reach is actively downcutti
downcutting through older stream deposits of coarse material

Last rains within previous 24 hours

Average Riffle Width (feet):	34.5
Riffle Slope (%)	0.026

Station	BS	HI	FS	Elevation (feet)	Water Depth (feet)	Water Surface Elevation	Comments
SET-UP #1							
Station Location	longitudinal station 0 feet, pool at head of riffle						
BM 1	6.15	106.15		100.00			LE XS 2, top of pin
BM 2		106.15	5.97	100.18			RE XS 2, top of pin
1-1'							
0.8		106.15	6.86	99.29	0.64	99.93	LEW
3.0		106.15	7.30	98.85	1.08	99.93	bed consists of fine gravels to cobbles, not imbedded
7.0		106.15	7.27	98.88	1.03	99.91	"
11.0		106.15	6.98	99.17	0.74	99.91	"
15.0		106.15	7.43	98.72	1.19	99.91	"
19.0		106.15	7.15	99.00	0.93	99.93	"
23.0		106.15	6.82	99.33	0.60	99.93	"
26.0		106.15	6.25	99.90	0.00	99.90	REW
Station Location	longitudinal station 24 feet, pool at head of riffle						
2-2'							
0.0		106.15	6.71	99.44	0.42	99.86	LEW
3.0		106.15	6.61	99.54	0.30	99.84	bed consists of gravels to small cobbles, not imbedded
6.0		106.15	6.78	99.37	0.49	99.86	"
9.0		106.15	6.89	99.26	0.62	99.88	"
12.0		106.15	7.05	99.10	0.78	99.88	"
15.0		106.15	7.27	98.88	0.96	99.84	"
18.0		106.15	7.17	98.98	0.93	99.91	"
21.0		106.15	7.27	98.88	1.04	99.92	"
24.0		106.15	6.92	99.23	0.65	99.88	"
27.0		106.15	6.88	99.27	0.62	99.89	"
29.0		106.15	6.30	99.85	0.00	99.85	REW
Station Location	longitudinal station 54 feet, pool at head of riffle						Crest of riffle at station 60 feet
3-3'							
2.0		106.15	6.34	99.81	0.00	99.81	LEW
5.0		106.15	6.75	99.40	0.38	99.78	bed consists of gravels to small cobbles, not imbedded
8.0		106.15	6.92	99.23	0.59	99.82	"

11.0	106.15	7.05	99.10	0.68	99.78	"
14.0	106.15	7.05	99.10	0.66	99.76	"
17.0	106.15	7.06	99.09	0.69	99.78	"
20.0	106.15	7.09	99.07	0.77	99.84	"
23.0	106.15	7.22	98.93	0.82	99.75	"
26.0	106 15	6.95	99.20	0.61	99.81	"
29.0	106.15	6.92	99.23	0.55	99.78	"
33.1	106.15	6.37	99.78	0.00	99.78	REW
Station Location	longitudinal station 91.0 feet, head of riffle					**First monumented x-section**
4-4'						
0.0	106.15	5.17	100.98			LE XS-4 top of pin
0.0	106.15	5.79	100.36			LE XS-4 bottom of pin
3.0	106.15	6.44	99.71			channel bank
6.1	106.15	6.74	99.41	0.00	99.41	LEW: tall grasses
9.0	106.15	7.32	98.83	0.63	99.46	
11.0	106.15	7.17	98.98	0.58	99.56	bed consists of medium gravels to small cobbles
13.0	106.15	7.23	98.92	0.59	99.51	"
15.0	106.15	7.51	98.64	0.83	99.47	"
17.0	106.15	7.37	98.78	0.69	99.47	"
19.0	106.15	7.35	98.80	0.66	99.46	"
21.0	106.15	7.48	98.67	0.80	99.47	"
23.0	106.15	7.33	98.82	0.63	99.45	"
25.0	106.15	7.27	98.88	0.54	99.42	"
27.0	106.15	7.35	98.80	0.62	99.42	"
29.0	106.15	7.33	98.82	0.58	99.40	"
32.5	106.15	6.76	99.39	0.00	99.39	REW
37.0	106.15	6.97	99.18			start of gravel bar
43 0	106.15	7.51	98.64			bar is covered by lettuce like grasses
49.0	106.15	7.80	98.35			standing water
51.8	106.15	8.19	97.96	0.47	98.43	LEW of branch channel-accounts for ~5 % of total Q
52.6	106.15	8.24	97.91	0.59	98.50	
54.4	106.15	8.01	98.14	0.32	98.46	
58.0	106.15	7.58	98.57	0.00	98.57	REW: gravels
64.7	106.15	6.18	99.97			RE XS-4 bottom of pin
64 7	106.15	5.97	100.18			RE XS-4 top of pin
Station Location	longitudinal station 116 feet, middle of riffle					**Second monumented cross-section**
5-5'						
0.0	106.15	3.27	102.88			LE XS-5 top of pin
0.0	106.15	3.71	102.44			LE XS-5 bottom of pin
1.6	106.15	4.16	101.99			edge of bank
2.0	106.15	6.39	99.76			base of cut bank
4.5	106.15	7.27	98.88	0.32	99.20	LEW
8.2	106.15	7.37	98.78	0 43	99.21	bed consists of gravels and cobbles
11.0	106.15	7.55	98.60	0.59	99.19	"
14.0	106.15	7.46	98.69	0.64	99.33	"
17.0	106.15	7.48	98.67	0.52	99.19	behind large gravel
20.0	106.15	7.37	98.78	0.39	99.17	"

23.0	106.15	7.28	98.87	0.28	99.15	descending riffle structure
26.0	106.15	7.38	98.77	0.30	99.07	"
29.0	106.15	7.48	98.67	0.34	99.01	"
32.0	106.15	7.85	98.30	0.61	98.91	"
35.0	106.15	7.83	98.32	0.47	98.79	"
38.0	106.15	8.03	98.12	0.44	98.56	"
41.0	106.15	8.05	98.10	0.32	98.42	on submerged grasses
44.0	106.15	8.44	97.71	0.73	98.44	base of riffle structure
47.0	106.15	8.36	97.79	0.62	98.41	"
50.0	106.15	8.08	98.07	0.32	98.39	"
53.6	106.15	7.77	98.38	0.00	98.38	REW
57.0	106.15	7.15	99.00			channel banks-gravels
60.6	106.15	6.14	100.01			RE XS-5 bottom of pin
60.6	106.15	5.97	100.18			RE XS-5 top of pin
Station Location 6-6"	longitudinal station 148 feet, toe of riffle					**Third monumented cross-section**
0.0	106.15	6.14	100.01			LE XS-6 top of pin
0.0	106.15	6.32	99.83			LE XS-6 bottom of pin
5.0	106.15	6.44	99.71			on cobbles
10.0	106.15	6.51	99.64			"
15.0	106.15	6.90	99.25			
20.0	106.15	7.28	98.87			willows
25.0	106.15	7.40	98.75			standing water
30.0	106.15	7.72	98.43			"
33.0	106.15	7.90	98.25	0.36	98.61	LEW
35.0	106.15	7.66	98.49	0.00	98.49	on gravels
37.0	106.15	8.01	98.14	0.20	98.34	
39.0	106.15	8.25	97.90	0.38	98.28	
41.0	106.15	8.41	97.74	0.42	98.16	
43.0	106.15	8.62	97.53	0.47	98.00	
45.0	106.15	8.52	97.63	0.27	97.90	
48.0	106.15	8.84	97.31	0.33	97.64	edge of high flow zone
50.0	106.15	9.10	97.05	0.61	97.66	
52.0	106.15	9.24	96.91	0.83	97.74	
54.0	106.15	9.38	96.77	1.00	97.77	
56.0	106.15	9.11	97.04	0.54	97.58	
58.0	106.15	8.92	97.23	0.46	97.69	
60.9	106.15	8.47	97.68	0.00	97.68	REW
65.0	106.15	7.84	98.31			base of bank
69.5	106.15	6.32	99.83			RE XS-6 bottom of pin
69.5	106.15	6.13	100.02			RE XS-6 top of pin
Station Location 7-7'	longitudinal station 181 feet, pool below riffle					Riffle ends at station 172
3.0	106.15	9.46	96.69	0.00	96.69	Top of bank
6.0	106.15	10.05	96.10	0.62	96.72	LEW: standing water
8.2	106.15	10.25	95.90	0.83	96.73	
10.0	106.15	10.38	95.77	0.99	96.76	LEW: moving water
12.0	106.15	10.38	95.77	1.03	96.80	
14.0	106.15	10.61	95.54	1.26	96.80	

16.0		106.15	10.67	95.48	1.30	96.78	
18.0		106.15	10.40	95.75	1.04	96.79	
20.0		106.15	10.05	96.10	0.64	96.74	
22.0		106.15	9.61	96.54	0.20	96.74	
24.1		106.15	9.41	96.74	0.00	96.74	REW
25.5		106.15	7.81	98.34			top of bank: gravel / cobbles
Station Location	longitudinal station 210 feet, pool below riffle						
8-8'							
0.0		106.15	9.51	96.64	0.00	96.64	LEW
5.0		106.15	10.62	95.53	1.22	96.75	
10.0		106.15	11.13	95.02	1.74	96.76	
18.0		106.15	11.56	94.59	2.16	96.75	
24.0		106.15	11.08	95.07	1.68	96.75	
27.9		106.15	9.43	96.72	0.00	96.72	REW
29.5		106.15	7.95	98.20			middle of channel bank
BM 1	6.15	106.15		100.00			Closure
BM 2		106.15	5.97	100.18			Closure

Project Number	200105
Stream	Coytoe Creek
Location	Coyote 5: Tully Road Bridge, City of San Jose
Date	01/26/01
Time	8:30 a.m. - 12:30 p.m.
Length of Reach Measured (feet)	
Length of Riffle (feet)	
Q measured (cfs)	13.70

Comments for Reach

Clear skies and cold temperatures (~50)
Water slightly milky in color, carrying some turbidity
Bed material: coarse sand to large cobbles (rip-rap) covered in algae
Last rains within previous 24 hours

Average Riffle Width (feet):	21.8
Slope (%)	0.020

Station	BS	HI	FS	Elevation (feet)	Water Depth (feet)	Water Surface Elevation	Comments
SET-UP #1							
Station Location	longitudinal station 7 feet, pool at head of riffle						
BM 1	3.26	103.26		100.00			LE XS 1, top of pin
BM 2		103.26	5.44	97.82			LE XS 2, top of pin
1-1'							
0.0		103.26	5.69	97.57	0.00	97.57	LEW
8.0		103.26	8.50	94.76	2.38	97.14	bed consists of sand to gravels
22.0		103.26	7.82	95.44	2.16	97.60	"
30.0		103.26	7.35	95.91	1.70	97.61	"
33.0		103.26	5.69	97.57	0.00	97.57	REW
Station Location	longitudinal station 22 feet, pool at head of riffle						
2-2'							
6.0		103.26	5.67	97.59	0.00	97.59	LEW
14.0		103.26	7.04	96.22	1.34	97.56	
22.0		103.26	6.63	96.63	0.95	97.58	
30.0		103.26	5.68	97.58	0.00	97.58	REW
Station Location	longitudinal station 48 feet, pool at head of riffle, beginning of bridge abutment						
3-3'							
1.3		103.26	5.78	97.48	0.00	97.48	LEW
5.0		103.26	6.36	96.90	0.60	97.50	
7.0		103.26	6.68	96.58	0.93	97.51	
9.0		103.26	6.68	96.58	0.91	97.49	
11.0		103.26	6.40	96.86	0.68	97.54	
13.0		103.26	6.28	96.98	0.51	97.49	
15.0		103.26	6.20	97.06	0.48	97.54	on gravel bar
17.0		103 26	6.53	96.73	0.79	97.52	
19.0		103.26	6.91	96.35	1.18	97.53	
22.8		103.26	6.97	96.29	1.25	97.54	
24.0		103.26	6.75	96.51	1.02	97.53	bridge pier
Station Location	longitudinal station 63.5 feet, head of riffle at station 56						**First monumented x-section**
4-4'							

0.3	103.26	3.26	100.00			LE XS-4 top of pin
2.0	103.26	3.45	99.81			LE XS-4 bottom of pin
4.0	103.26	3.87	99.39			on channel bank
6.0	103.26	4.10	99.16			"
8.0	103.26	4.31	98.95			top of bank
10.0	103.26	5.91	97.35	0.00	97.35	LEW
12.0	103.26	6.33	96.93	0.45	97.38	gravels and cobbles
14.0	103.26	6.95	96.31	0.98	97.29	"
16.0	103.26	6.81	96.45	0.89	97.34	"
18.0	103.26	6.50	96.76	0.60	97.36	"
20.0	103.26	6.50	96.76	0.54	97.30	"
22.0	103.26	6.57	96.69	0.68	97.37	"
24.0	103.26	6.59	96.67	0.69	97.36	"
26.3	103.26	6.49	96.77	0.51	97.28	"
29.0	103.26	6.19	97.07	0.26	97.33	"
32.0	103.26	6.10	97.16	0.23	97.39	"
35.0	103.26	5.87	97.39	0.10	97.49	"
35.0	103.26	6.02	97.24	0.20	97.44	bridge pier
Station Location	longitudinal station 99.0 feet, middle of riffle					**Second monumented cross-section**
5-5'						
0.0	103.26	5.43	97.83			LE XS-5 top of pin
0.0	103.26	5.61	97.65			LE XS-5 bottom of pin
2.0	103.26	6.13	97.13			approximate bankfull
3.1	103.26	7.07	96.19	0.00	96.19	LEW
5.0	103.26	6.13	97.13	0.00	97.13	on top of log
7.0	103.26	7.49	95.77	0.48	96.25	bed consists of cobbles and small boulders
9.0	103.26	7.56	95.70	0.52	96.22	"
11.0	103.26	7.77	95.49	0.77	96.26	"
13.0	103.26	7.72	95.54	0.63	96.17	downstream of rip-rap
15.0	103.26	7.82	95.44	0.78	96.22	"
17.0	103.26	7.77	95.49	0.75	96.24	"
19.0	103.26	7.61	95.65	0.54	96.19	"
21.0	103.26	7.55	95.71	0.44	96.15	"
23.2	103.26	7.10	96.16	0.00	96.16	REW
25.0	103.26	6.77	96.49			
28.5	103.26	6.76	96.50			RE XS-5 top of pin
28.5	103.26	6.53	96.73			RE XS-5 bottom of pin
Station Location	longitudinal station 137.2 feet, toe of riffle					**Third monumented cross-section**
6-6"						
0.0	103.26	4.84	98.42			LE XS-6 top of pin
0.0	103.26	4.97	98.29			LE XS-6 bottom of pin
2.0	103.26	5.77	97.49			
3.9	103.26	6.56	96.70			top of bank
4.2	103.26	7.49	95.77	0.20	95.97	LEW
6.0	103.26	7.92	95.34	0.66	96.00	
8.0	103.26	8.03	95.23	0.71	95.94	
10.0	103.26	7.79	95.47	0.39	95.86	
12.0	103.26	7.72	95.54	0.38	95.92	
14.0	103.26	7.79	95.47	0.43	95.90	
16.0	103.26	7.97	95.29	0.61	95.90	

18.0		103.26	7.91	95.35	0.40	95.75	
20.0		103.26	8.11	95.15	0.64	95.79	
22.0		103.26	8.1	95.16	0.65	95.81	
24.4		103.26	7.47	95.79	0.00	95.79	REW
27.0		103.26	7.17	96.09			on channel bank
29.2		103.26	7	96.26			RE XS-6 top of pin
29.2		103.26	6.91	96.35			RE XS-6 bottom of pin
Station Location	longitudinal station 157 feet, pool below riffle						
7-7'							
0.0		103.26	7.99	95.27	0.00	95.27	LEW
4.0		103.26	9.85	93.41	1.97	95.38	thalweg
8.1		103.26	8.11	95.15	0.00	95.15	REW
Station Location	longitudinal station 171 feet, pool below riffle						
8-8'							
0.0		103.26	7.99	95.27	0.00	95.27	LEW
6.0		103.26	9.95	93.31	2.01	95.32	thalweg
11.4		103 26	7.94	95.32	0.00	95.32	REW
Station Location	longitudinal station 195 feet, pool below toe of riffle						
9-9'							
0.0		103.26	7.96	95.30	0.00	95.30	LEW
5.0		103 26	9.98	93.28	2.02	95.30	thalweg
10.7		103.26	8	95.26	0.00	95.26	REW
Station Location	longitudinal station 150 feet, downstream end of pier at current base						
		103.26	5.48	97.78			8.31 on stadia rod = 110 on bridge pier with an arbitrary elev
BM 1	3.26	103.26		100.00			Closure
BM 2		103.26	5 44	97.82			Closure

APPENDIX C

[redacted]

Balance Hydrologics, Inc.
900 Modoc
Berkeley, California 94707

Project No. 200105
Gage No.
Stream Stevens Creek
Location McClellan Ranch
Date 2/24/01

Conditions and Observations

Observer(s): SDS
Weather & Conditions: scattered clouds after early morning rains
Temperatures:
Hydrograph: ☐ Raising ☒ Falling ☒ Uncertain ☐ Baseflow
If falling, approximate time of previous peak:

Procedures

Measurement at: 40' u/s riffle
Method: [✓ 0.6] 0.2/0.8 Other
Meter No. BAL # 737
Spin Test:
Suspension: [✓ Rod] Cable
Measurement rated: Excellent (±2%) Good (±5%) Fair (±8%) Poor ( )

Gage Heights

Time	Staff	Other
SEE RIFFLE	CREST DEPTHS	

Observed High-Water Marks

Approx. Gage Height	Est. date

Remarks

vis. est. ≈ 40 cfs (DS)
SC getting riffle depth meas.
water is slightly cloudy, light green tinge
This appears to be peak flow for this year (possibly rising)

Hydraulic Geometry

Area:
Width: Top Bed
Depth:
Velocity:
Slope:

Crest Stage Data

Observed Crest G.H.
Adjustment:
Adjusted Crest G.H.:
Remarks:
Reset Repair

Coefficients Utilized and Explanation:

Changes in conditions since last visit?

Concurrent water quality, sediment or biological measurements/sampling conducted

Discharge Measurement Notes

LEW

Coeff.	Station	~~Width~~ Flow Depth	~~Flow Depth~~ Width	Obs. Depth	Revs.	Secs.	Velocity At point	Velocity Avg.	Horiz. or Vert. Adjust.	Area (ft²)	Discharge (cfs)	Bed*
	2.5	–								–	–	
1.75	4.0	0.20	1.75	0.6	8	36.6	.50			.35	.18	G,C
2	6.0	0.40'	2.00		10	31.3	.72			.80	.58	
2	8.0	0.65	2.00		15	30.5	1.09			1.3	1.42	
2	10.0	0.90	2.00		15	35.1	.95			1.8	1.71	
2	12.0	0.85	2.00		20	36.6	1.21			1.7	2.06	
2	14.0	0.9	2.00		20	35.3	1.26			1.8	2.27	
2	16.0	1.15	2.00		20	35.2	1.26			2.3	2.90	
2	18.0	1.45	2.00		15	31.4	1.06			2.9	3.07	
2	20.0	1.90	2.53		12	24.9	1.07			3.8	4.07	
2	22.0	1.80	2.00	S	15	36.4	.92			3.6	3.31	
1.5	24.0	0.85	1.50	S	7	32.7	.49			1.28	.62	
	25.0									–	–	
		0.97					0.96				22.19	cfs gpm

REW

*Bed Key: M (Mud, Muck), S(Silt, Sand), G(Gravel), C(Cobbles), B(Boulders), BR(Bedrock), RP(Riprap), CON(Concrete), FP(Floodplain, Overbank), Other

Hecht 3/88

Computations

Date:	By:	Reviewed:
02/26/01	SMC	EXCEL

REW: 25.5'
LEW: 0.4'
25.1' = W

Balance Hydrologics, Inc.
900 Modoc
Berkeley California 94707

Q CALCULATION
INCORRECT: SEE ATTACHED
TABLE FOR CORRECT CALC'S

Project No. 200105
Gage No. —
Stream STEVENS CREEK
Location McCLELLAN RANCH
Date 01/10/00

Conditions and Observations
Observer(s): SHAWN CHARTRAND
Weather & Conditions: RAINING, VERY WINDY
Temperatures: 55°F
Hydrograph: ☒ Raising ☐ Falling ☐ Uncertain ☐ Baseflow
If falling, approximate time of previous peak:

Procedures
Measurement at: 4.5' UPSTREAM OF CREST OF RIFFLE
Method: [✓ 0.6] 0.2/0.8 Other
Meter No. 0018 / SII 059
Spin Test: YES - 90SEC.
Suspension: Rod Cable
Measurement rated: Excellent (±2%) [✓ Good (±5%)] Fair (±8%) Poor ( )

Gage Heights

Time	Staff	Other

Observed High-Water Marks

Approx. Gage Height	Est. date

Remarks WATER MODERATELY TURBID, SEEM TO BE HITTING THE PEAK OF THE STORM RUNOFF

Hydraulic Geometry
Area:
Width: Top Bed
Depth:
Velocity:
Slope:

Crest Stage Data
Observed Crest G.H.
Adjustment:
Adjusted Crest G.H.:
Remarks:
Reset Repair

Coefficients Utilized and Explanation:

Changes in conditions since last visit?

Concurrent water quality, sediment or biological measurements/sampling conducted

Discharge Measurement Notes

Coeff.	Station	Width	Flow Depth	Obs. Depth	Revs.	Secs.	Velocity At point	Velocity Avg.	Horiz. or Vert.* Adjust.	Area (ft²)	Discharge (cfs)	Bed*
	1.5	1.5	0.7		24	60	.89			2.1	1.87	
	3.0	↑	0.83		25	60	.93			2.49	2.3	
	4.5		0.90		23	60	.86			2.7	2.3	
	6.0		0.80		7	60	.27			2.4	.66	HIDDEN
	7.5		0.90		6	60	.24			2.7	.64	
	9.0		0.82		18	60	.67			2.46	1.65	
	10.5		0.80		39	60	1.43			2.4	3.44	
	12.0		0.65		35	60	1.29			1.95	2.51	
	13.5		0.65		35	60	1.29			1.95	2.51	
	15.0		0.60		13	60	.49			1.80	.89	
	16.5		0.52		41	60	1.51			1.56	2.35	
	18.0		0.45		37	60	1.36			1.35	1.84	
	19.5		0.40		26	60	.96			1.20	1.16	
	21.0		0.35		26	60	.96			1.05	1.01	
	22.5		0.46		29	60	1.07			1.20	1.29	
	24.0	↓	0.30		12	60	.46			0.90	.41	

AVG D = 0.63'

cfs
gpm

*Bed Key: M (Mud, Muck), S(Silt, Sand), G(Gravel), C(Cobbles), B(Boulders), BR(Bedrock), RP(Riprap), CON(Concrete), FP(Floodplain, Overbank), Other

Hecht 3/88

Computations
Date: 01/10/00 By: SMC Reviewed:

Discharge form.xls,Q Form

Location	Stevens Creek @ McClellan Ranch
Date	1/10/01
LEW:	0.4
REW:	25.5

Meter #	0618 (Balance I.D.), SII 059, AA meter
Spin Test	60 seconds+
Observer	SMC
Comments	

# Verticals	Coefficient	Station	Width	Flow Depth	Observed Depth	Revolutions	Seconds	Velocity	Area	Discharge
1		1.5	1.3	0.70	0.6	24	60	0.892	0.91	0.812
2		3.0	1.5	0.83	0.6	25	60	0.928	1.25	1.156
3		4.5	1.5	0.90	0.6	23	60	0.856	1.35	1.155
4		6.0	1.5	0.80	0.6	7	60	0.274	1.20	0.329
5		7.5	1.5	0.90	0.6	6	60	0.238	1.35	0.321
6		9.0	1.5	0.82	0.6	18	60	0.674	1.23	0.829
7		10.5	1.5	0.80	0.6	39	60	1.437	1.20	1.724
8		12.0	1.5	0.65	0.6	35	60	1.292	0.98	1.259
9		13.5	1.5	0.65	0.6	35	60	1.292	0.98	1.259
10		15.0	1.5	0.60	0.6	13	60	0.492	0.90	0.443
11		16.5	1.5	0.52	0.6	41	60	1.510	0.78	1.178
12		18.0	1.5	0.45	0.6	37	60	1.364	0.68	0.921
13		19.5	1.5	0.40	0.6	26	60	0.965	0.60	0.579
14		21.0	1.5	0.35	0.6	26	60	0.965	0.53	0.506
15		22.5	1.5	0.40	0.6	29	60	1.074	0.60	0.644
16		24.0	1.5	0.30	0.6	12	60	0.456	0.45	0.205
17										
18										
19										
20										
21										
22										
23										
24										
25										

Q = **13.322**

McCLELLAN RANCH

Balance Hydrologics, Inc.
900 Modoc
Berkeley, California 94707

Project No. 200105
Gage No.
Stream Stevens Cr.
Location 549 + 50
Date 11/20/0 15:27

Conditions and Observations
Observer(s): BJM, SC
Weather & Conditions: clear skys, cool (52° F)
Temperatures:
Hydrograph: ☐ Raising ☐ Falling ☐ Uncertain ☒ Baseflow
If falling, approximate time of previous peak:

Procedures
Measurement at: AL 0428 PY

Method: [✓ 0.6] 0.2/0.8 Other
Meter No.
Spin Test: 50 sec
Suspension: Rod Cable
Measurement rated: Excellent (±2%) [✓ Good] (±5%) [✓ Fair] (±8%) Poor ( )

Gage Heights

Time	Staff	Other

Observed High-Water Marks

Approx. Gage Height	Est. date

Remarks: Bed - gravels covered in algae

15:34
LEW
☐

REW
△
15:58

Hydraulic Geometry
Area:
Width: Top Bed
Depth:
Velocity:
Slope:

Crest Stage Data
Observed Crest G.H.
Adjustment:
Adjusted Crest G.H.:
Remarks:
Reset Repair

Coefficients Utilized and Explanation:

Changes in conditions since last visit?

Concurrent water quality, sediment or biological measurements/sampling conducted

Discharge Measurement Notes

Coeff.	Station	Width	Flow Depth	Obs. Depth	Revs.	Secs.	Velocity At point	Velocity Avg.	Horiz. or Vert. Adjust.	Area (ft²)	Discharge (cfs)	Bed*
	1.6		0.24					0				
	2.5	1.70'	.25	–	20	32.3	.62			1.95	1.21	G
	5	2.5'	.40	–	20	35.4	.56			1.0	.56	
	7.5	1.75'	.44'	–	20	31.6	.63			.77	.49	
	8.5	1.25'	.50	–	40	38	1.05			.63	.66	
	10	1.25'	.33	–	40	37.8	1.05			.41	.43	
	11	1.25'	.33	–	40	34	1.17			.41	.48	
	12.5	2.0'	.38	–	20	43.3	.46			.76	.35	
	15	1.75'	.24	–	13	51	.25			.42	.11	
	16	1.25'	.12	–	7	37.4	.19			.15	.03	
	17.5	2.0'	.15	–	20	33				.30	.18	
	20	2.5'	.08	S	15	28.6	.52			.20	.10	
	22.5	1.63'	.15		15	46	.32			.25	.08	
	23.5	1.25'	.09	S	15	39.9	.38			.11	.04	
	25		0					0				
										7.36	4.72	cfs
												gpm

PYGMY V(FPS) = 1 REV/SEC = 1 F/S

***Bed Key:** M (Mud, Muck), S(Silt, Sand), G(Gravel), C(Cobbles), B(Boulders), BR(Bedrock), RP(Riprap), CON(Concrete), FP(Floodplain, Overbank), Other

Hecht 3/88

Computations
Date: 11/20/00
By: SMC
Reviewed:

Balance Hydrologics, Inc.
900 Modoc
Berkeley, California 94707

CHESTNUT PARK

Project No. 200105
Gage No.
Stream Stevens Cr
Location XSec-1
Date 11/20/0

Conditions and Observations

Observer(s): BJM, SC
Weather & Conditions: Sunny, cold
Temperatures:
Hydrograph: ☐ Raising ☐ Falling ☐ Uncertain ☒ Baseflow
If falling, approximate time of previous peak:

Procedures

Measurement at: XSec-1
Method: [✓ 0.6] 0.2/0.8 Other
Meter No. AL 0428 PY
Spin Test: 53sec
Suspension: Rod [✓ Cable]
Measurement rated: Excellent (±2%) Good (±5%) Fair (±8%) Poor ( )

Gage Heights

Time	Staff	Other

Observed High-Water Marks

Approx. Gage Height	Est. date

Remarks

Hydraulic Geometry

Area:
Width: Top Bed Cobbles
Depth:
Velocity:
Slope:

Crest Stage Data

Observed Crest G.H.
Adjustment:
Adjusted Crest G.H.:
Remarks:
Reset Repair

Coefficients Utilized and Explanation: algae covered cobbles w/ gravel interstitial - very little sand - just a few pockets

Changes in conditions since last visit?

Concurrent water quality, sediment or biological measurements/sampling conducted

Discharge Measurement Notes

Coeff.	Station	Width	Flow Depth	Obs. Depth	Revs.	Secs.	Velocity At point	Velocity Avg.	Horiz. or Vert. Adjust.	Area (ft²)	Discharge (cfs)	Bed*
	3'		0									
	4.5'	1.5'	.78	–	30	31.9	.94	.76		1.17	1.09	c
	6'	1.5'	0.8	–	35	41.5	.84			1.2	1.01	C
	7.5'	1.5'	0.57	–	35	35.2	1.0			.86	.86	C
	9'	1.5'	0.45	–	35	36.5	.96			.68	.65	C
	10.5'	1.5'	.47	–	30	35.8	.84			.71	.60	C
	12'	1.5'	.28	–	30	37	.81			.42	.34	C
	13.5'	1.5'	0.19	–	8	33.7	.24			.29	.07	C
	15'	1.5'	0.10	S	14	31.4	.45			.15	.07	C
	16.5'	1.5'	0.02	–				0				C
	18'	1.5'		–				0				
	19.5	1.5'		–				0				
	20.4		0	–								

LEW 0

15.9 (Last readable flow)

REW 0

PYGMY: V (FS) = 1 REV/SEC = 1 F/S

5.48 4.7 cfs
gpm

*Bed Key: M (Mud, Muck), S(Silt, Sand), G(Gravel), C(Cobbles), B(Boulders), BR(Bedrock), RP(Riprap), CON(Concrete), FP(Floodplain, Overbank), Other

Hecht 3/88

Computations

Date:	By:	Reviewed:
11/26/00	SMC	

Balance Hydrologics, Inc.
900 Modoc
Berkeley, California 94707

Project No. 200105
Gage No.
Stream Stevens Cr
Location Homestead Rd (Rosgen)
Date 11/21/0

Conditions and Observations

Observer(s): BJM SC
Weather & Conditions: cloudy, cold (45°F) - light rain at 8:00AM for approx 15min
Temperatures:
Hydrograph: ☐ Raising ☐ Falling ☒ Uncertain ☐ Baseflow
If falling, approximate time of previous peak:

9:48
LEW
D

Procedures

Measurement at: above riffle - at xs-1

Method: [✓ 0.6] 0.2/0.8 Other
Meter No. AL0128 PY
Spin Test: 50 sec
Suspension: Rod Cable
Measurement rated: Excellent (±2%)
Good✓ (±5%)
Fair (±8%)
Poor ( )

Gage Heights

Time	Staff	Other

Observed High-Water Marks

Approx. Gage Height	Est. date

Remarks See SC's field book

Hydraulic Geometry

Area:
Width: Top Bed
Depth:
Velocity:
Slope:

Crest Stage Data

Observed Crest G.H.
Adjustment:
Adjusted Crest G.H.:
Remarks:
Reset Repair

Coefficients Utilized and Explanation:

Changes in conditions since last visit?

Concurrent water quality, sediment or biological measurements/sampling conducted

REW
D
10:66

Discharge Measurement Notes

Coeff.	Station	Width	Flow Depth	Obs. Depth	Revs.	Secs.	Velocity At point	Velocity Avg.	Horiz. or Vert. Adjust.	Area (ft²)	Discharge (cfs)	Bed*
	8.2		0									
	9.5	1.4	.19	—	10	31	.32			.27	.09	S
	11	1.5	.30	—	15	43	.35			.45	.16	S
	12.5	1.5	.13	—	9	51	.18			.20	.09	on cobble
	14	1.5	.11	S	10	32	.29			.17	.05	on cobble
	15.5	1.5	.12	S	15	36	.44			.18	.08	S
	17	1.5	.25	—	7	58	.13			.38	.05	G
	18.5	1.5	.32	—	7	40	.18			.48	.08	S
	20	1.5	.57	—	10	34	.29			.86	.25	C
	21.5	1.5	.88	—	15	42	.36			1.32	.47	S
	23	1.5	.55	—	25	40	.63			.83	.53	B
	24.5	1.5	1.00	—	12	36	.33			1.5	.50	C
	26	0.90	1.18	—	1	59	.02			1.06	.02	
	26.3		0									
										7.7	2.3	cfs gpm

PYGMY : V(FS) = 1 REV|SEC = 1 F|S

*Bed Key: M (Mud, Muck), S(Silt, Sand), G(Gravel), C(Cobbles), B(Boulders), BR(Bedrock), RP(Riprap), CON(Concrete), FP(Floodplain, Overbank), Other

Hecht 3/88

Computations

Date: 11/22/00
By: SMC
Reviewed:

Balance Hydrologics, Inc.
900 Modoc
Berkeley, California 94707

Project No. 200105
Gage No.
Stream Stevens Cr
Location Fremont Rd Bridge
Date 11/21/0

Conditions and Observations
Observer(s): BJM, SC
Weather & Conditions: light rain
Temperatures:
Hydrograph: ☐ Raising ☐ Falling ☒ Uncertain ☐ Baseflow
If falling, approximate time of previous peak:

15:00
LEW
Δ

Procedures
Measurement at: pool u/s of Fremont St bridge
Method: [✓ 0.6] 0.2/0.8 Other
Meter No. AL0428 PY
Spin Test: 60+
Suspension: Rod Cable
Measurement rated: Excellent (±2%) Good (±5%) Fair (±8%) Poor ( )

Gage Heights

Time	Staff	Other

Observed High-Water Marks

Approx. Gage Height	Est. date

Remarks water brown + cloudy after light rain

See surveying notes (XS-1)

Hydraulic Geometry
Area:
Width: Top Bed
Depth:
Velocity:
Slope:

Crest Stage Data
Observed Crest G.H.
Adjustment:
Adjusted Crest G.H.:
Remarks:
Reset Repair

Coefficients Utilized and Explanation:

Changes in conditions since last visit?

Concurrent water quality, sediment or biological measurements/sampling conducted

Discharge Measurement Notes

Coeff.	Station	Width	Flow Depth	Obs. Depth	Revs.	Secs.	Velocity At point	Velocity Avg.	Horiz. or Vert. Adjust.	Area (ft²)	Discharge (cfs)	Bed*
	10.6		0									S
	12.5	1.95	2.05	—	0						—	S
	14.5	2.0	.08	S	10	43	.23			.16	.04	G
	16.5	2.0	.12	—	15	45	.33			.24	.08	G+ c
	18.5	2.0	.16	—	10	34	.29			.32	.09	G+ c
	20.5	2.0	.21	—	15	37	.41			.42	.17	G+ c
	22.5	2.0	.19	—	10	33	.30			.38	.11	on cobble
	24.5	2.0	.48	—	10	42	.24			.96	.23	G+C
	26.5	2.0	.86	—	10	41	.24			1.72	.41	C
	28.5	2.0	.99	—	10	28	.36			1.98	.71	C
	30.5	2.0	1.05	—	7	39	.18			2.1	.38	
	32.5	1.35	.95	—	0						—	
	33.2		0									

REW
☐
15:17

2.22 cfs
gpm

PYGMY: V(FS) 1 REV/SEC = 1 F/S

*Bed Key: M (Mud, Muck), S(Silt, Sand), G(Gravel), C(Cobbles), B(Boulders), BR(Bedrock), RP(Riprap), CON(Concrete), FP(Floodplain, Overbank), Other

Hecht 3/88

Computations

Date: 11/22/00	By: SMC	Reviewed:

Balance Hydrologics, Inc.
900 Modoc
Berkeley, California 94707

Project No. 700103
Gage No.
Stream Stevens Cr.
Location Steig McClellan
Date 11/20/00 16:48

Conditions and Observations

Observer(s): SC, BJM
Weather & Conditions: clear, cool
Temperatures:
Hydrograph: ☐ Raising ☐ Falling ☐ Uncertain ☐ Baseflow
If falling, approximate time of previous peak:

Procedures

Measurement at:
Method: [✓ 0.6] 0.2/0.8 Other
Meter No. AL0428 PY
Spin Test: 50
Suspension: Rod Cable
Measurement rated: Excellent (±2%) Good (±5%) Fair (±8%) Poor ( )

Gage Heights

Time	Staff	Other

Observed High-Water Marks

Approx. Gage Height	Est. date

Remarks

Hydraulic Geometry

Area:
Width: Top Bed
Depth:
Velocity:
Slope:

Crest Stage Data

Observed Crest G.H.
Adjustment:
Adjusted Crest G.H.:
Remarks:
Reset Repair

Coefficients Utilized and Explanation:

Changes in conditions since last visit?

Concurrent water quality, sediment or biological measurements/sampling conducted

Discharge Measurement Notes

16:50
D

Coeff.	Station	Width	Flow Depth	Obs. Depth	Revs.	Secs.	Velocity At point	Velocity Avg.	Horiz. or Vert. Adjust.	Area (ft²)	Discharge (cfs)	Bed*
	2.9		0	—								
	4	1.3	.50	—	1	60	0.02			0.65	0.013	
	5.5	1.5	.68	—	4	36	0.11			1.02	.11	
	7	1.5	.79	—	5	44	0.11			1.19	.13	
	8.5	1.5	.80	—	5	31	0.16			1.2	.19	
	10	1.5	.77	—	9	30	0.3			1.16	.35	
	11.5	1.5	.87	—	14	39	0.36			1.31	.47	
	13	1.5	.86	—	10	35	0.29			1.29	.37	
	14.5	1.5	.98	—	10	43	0.23			1.47	.34	
	16	1.5	.98	—	7	40	0.18			1.47	.26	
	17.5	1.5	.67	—	2	45	0.04			1.01	.04	
	19	1.5	.55	—	2	41	0.05			.83	.04	
	21.3						—					

17:05
REW
D

2.3 cfs
gpm

PYGMY (V) = 1 R/S = 1 FT/S

*Bed Key: M (Mud, Muck), S(Silt, Sand), G(Gravel), C(Cobbles), B(Boulders), BR(Bedrock), RP(Riprap), CON(Concrete), FP(Floodplain, Overbank), Other

Hecht 3/88

Computations

Date: 12/14/00
By: SMC
Reviewed:

Balance Hydrologics, Inc.
900 Modoc
Berkeley, California 94707

Project No. 200105
Gage No.
Stream Stevens Creek
Location Steep chestnuts
Date 001130 11:05

Conditions and Observations

Observer(s): BJM SC
Weather & Conditions: Sunny, 50°C cool
Temperatures:
Hydrograph: ☐ Raising ☐ Falling ☐ Uncertain ☐ Baseflow
If falling, approximate time of previous peak:

Procedures

Measurement at:

Method: 0.6 0.2/0.8 Other PY
Meter No. AL0478
Spin Test: 50
Suspension: Rod Cable
Measurement rated: Excellent (±2%) [✓ Good (±5%)] Fair (±8%) Poor ( )

Gage Heights

Time	Staff	Other

Observed High-Water Marks

Approx. Gage Height	Est. date

Remarks 3-4 cfs guess

Hydraulic Geometry

Area:
Width: Top Bed
Depth:
Velocity:
Slope:

Crest Stage Data

Observed Crest G.H.
Adjustment:
Adjusted Crest G.H.:
Remarks:
Reset Repair

Coefficients Utilized and Explanation: LONG STN: 27.4

Changes in conditions since last visit?

Concurrent water quality, sediment or biological measurements/sampling conducted

Discharge Measurement Notes

11:05 LEW D

Coeff.	Station	Width	Flow Depth	Obs. Depth	Revs.	Secs.	Velocity At point	Velocity Avg.	Horiz. or Vert. Adjust.	Area (ft²)	Discharge (cfs)	Bed*
	1		.21	–	0		0			–		
	2	1	.37	–	0		0			0.37	0	
	3	1.5	.63	–	2	90	0.02			0.95	.02	
	5	2	.81	–	10	52	0.19			1.62	.31	
	7	2	.50	–	10	34	0.29			1	.29	on cobble
	9	2	.53	–	10	40	0.25			1.06	.27	
	11	2	.37	–	15	35	0.43			.74	.32	
	13	2	.20	–	15	32	0.47			.40	.19	
	15	2	.18	–	25	32	0.78			.36	.28	
	17	2	.39	–	20	38	0.53			.80	.42	
	19	2	.37	–	15	30	0.5			.74	.37	
	21	2	.36	–	15	37	0.41			.72	.30	
	23	2	.20	–	2	30	0.07			.40	.03	
	25		0	–			0			0		

11:23 REW D

2.8 cfs
gpm

PYPMY (V) = 1 R/s = 1 F/s

*Bed Key: M (Mud, Muck), S(Silt, Sand), G(Gravel), C(Cobbles), B(Boulders), BR(Bedrock), RP(Riprap), CON(Concrete), FP(Floodplain, Overbank), Other

Hecht 3/88

Computations

Date: 12/14/00 By: SMC Reviewed:

200105

11/20/0 SC + BJM
leave SF 5:35
stop for breakfast in San Jose 6:45
arrive at site 7:50
site BH-3 First stop
clear skys, cold (45°F ?)
cleared kid dam - pool
depth decreased by about 2/10'

Set up level on left bank at 8:45
(Balance 10 0172)
about 20' d/s of tree ([illegible])

reach: 60' 4" in length

1st bench mark at tree, species unknown ([illegible])
20' u/s of level on left bank
2nd benchmark ≈ 40' d/s on left bank
on highest pt on rock (? chert)
scratched X on top (see picture)
riffle D50 64 (visual estimate)
larger rocks in u/s 1/3 of riffle
remnants of kiddam
low embeddedness esp u/s 1/3 of
riffle - some embeddedness d/s 2/3
section based on softness of bed

200105 FIELD NOTES

Most flow on left 1/6 of riffle
where it is deeper

water slightly turbid
some silt on bed
few leaves/large OM in water

STEVENS
CREEK

11/20/0 {BH-3} 200105

X-sec 1 Head of Riffle

Level - BJM
Rod - SC

Start 9 30 am 200105
longitudinal STN 5 [illegible] 11/20/00

STN	BS	HI	FS	HI	LO	ELEV	COMMENTS
BM 1	4.07	104.07				100.00	NAIL SPIKE IN BASE OF SYCAMORE
BM 2			6.00				HIGHPOINT ON RIP RAP MARKED ⓧ
3'			6.33				LEW XS-1 Head of [illegible]
6'			7.10				Water depth 0.75
9			6.82				WO = 0.49
12			6.66				WO = 0.32
15			6.52				WO = 0.17
18			6.37				WO = 0.05
21.3			6.33				REW
SHOT ON RIFFLE ~ THALWEG							
9.5'			6.85			✳	Head of riffle at 12' longitudinal [illegible] middle of riffle WO = 0.52
X-sec 2	longitudinal STN 16.9'						4' below crest of riffle
XS 2			3.20				L top of PIN (tallest of pin [illegible])
1.6'			4.51				BF / HWM (?)
4'			5.44				top of bank
4.7'			6.78				bottom of bank WO = 1.6
6			7.10				WO = 0.51
8			7.12				WO = 0.53
10			7.05				WO = 0.48
12			7.03				WO = 0.49
14			6.34				top of cobble

11/20/0 BH-3 200105 SC, BJM

200105
11/20/00

STN	BS	HI	FS	HI	LOW	ELEV	COMMENTS
							XS 2 (cont.)
16			6.88				WD= 0.27
18			6.88				WD=0.26
20			6.66				WD= 0.02
22			6.54				REW Start of gravel bar
26			6.51				↓
29			6.30				
33			6.07				start of riparian veg
37			5.25				↓
39.6			3.14				
40.5			7.27				Base of PIN
XS-2			7.04				R Top of PIN

XS - 3

STN	BS	HI	FS	HI	LOW	ELEV	COMMENTS
XS-3	Longitudinal STN 35.3						Middle of Riffle
XS-3			1.02				L Top of pin
XS-3			1.37				Bottom of pin
1.2			3.85				cut bank
3'			7.20				behind downtree WD=0 LEW
4'			7.38				WD= 0.46 COBBLES + GRAVEL
6			7.53				WD= 0.62 COBBLES + GRAVEL
8			7.42				WD= 0.53 COBBLES + GRAVEL
16.2			6.83				top of cobble
12			7.34				WD= 0.31
14			7.24				WD= 0.19

Bed covered in algae [illegible]

11/20/0 200105 SC, BJM BH-3

200105

11/20/00

STN	BS	HI	FS	HI	LOW	~~ELEV~~	COMMENTS
XS-3 (cont)							
16'			7.11				WD=0.11
18			7 07				WD=0.10
20			7.10				WD=0 17 gravels
22			7.14				WD= 0 13
24			7.22				WD= 0.25
26			7 22				WD= 0.24 bivalve shell
26.9			7.02				REW base of bank
27.5			5.63				bench on bank
28.5			4.85				rod on riparian veg
31			3.64				rod on riparian veg
34.4			2 91				base of pin
XS-3			2 60				R top of pin

XS-4 TOE OF RIFFLE LONG STN= 53.7 START 10:35

STN	BS	HI	FS	HI	LOW		COMMENTS
XS-4			4.85				LTOP OF PIN
XS-4			5.05				base of PIN
1.1			7.95				LEW WD = 0.50 base of cutbank
3'			8.31				WD= 0.87 behind car part
5'			8.48				WD= 1.01
7'			8.28				WD= 0 79
10'			8.02				WD = 0.48 base of gravel bar
12'			7.68				WD= 0.16

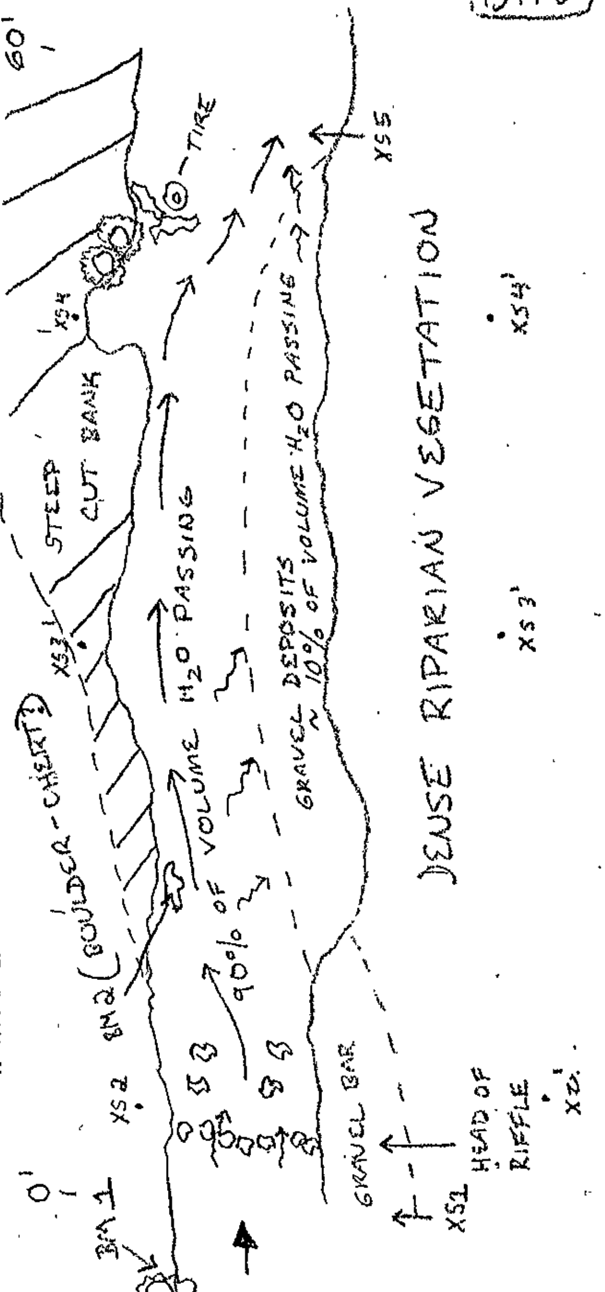
11/20/0 200105 SC, BJM BH-3
[illegible] level

200105
11/20/00

STN	BS	HI	FS	HI	LOW	ELEV	WD	COMMENTS
14'			7.38				0.03	XS-4 (cont.)
16			7.35				0.07	
18 4			7.27					REW
20			6.90					gravels
24.2			5.76					gravel bank
28.3			4.28					sand & thick willows
30.2			3 77					near bottom of pin
30.6(XS-4)			3.42					R top of pin (XS-4)
XS-5		LEW	4					Below base of riffle
		REW	17.8					Long. Stn 60.5'
7'			8.45				0.85	next to tire
9.7'			8.38				0.79	
12.5'			8.38				0.81	
15'			8.00				0.48	
17.8'			7.60					REW
4'			7.95				0.35	LEW behind log jam
BM 1	4.07	104.07				100.00		CLOSURE
BM 2			6.00					

BASE OF RIFFLE LONGITUDINAL
STATION: 56'

BH3



BM 1: NAIL IN D.S. ROOT OF LARGE TREE ON L.B. ~ 25' U.S. OF LE XS 2

BM 2: TOP OF LARGE BOULDER IN L.S. OF CHANNEL 10' DS OF LE XS 2

200105
11/20/00

PHOTOS (ROLL A). BH3

A1: LOOKING D.S. AT RIFFLE BH3, BM @ HEAD OF RIFFLE
A2: BM IN SAME LOCAL, SHOT FROM RIGHT BANK
A3: BM NEAR LE OF XS 4, NOTE FLOW NEAR LEFT BANK
A4: LOOKING DS, BM STANDING @ XS 5, NOTE POOL BELOW
A5: SHOT 6' BELOW BASE OF RIFFLE, BM NEAR LB AND LE XS 4

* LEFT RIFFLE FOR CAR @ 12:15 PM

LUNCH 12:30 - 1:00 PM

LEFT CHESTNUT PINIC PARKING FOR McCLELLAN RANCH SITES

11/20/0 200105 SC, BJM 549.50

McClellan Ranch 13 45

sunny, cool (55°F)

- removed kid dam
- water slightly turbid

BED - DB50 = gravels (large)

visual estimate
30% embedded - based
on softness of bed
some large cobbles + concrete +
RR timbers

→ upper 2/3 of riffle

lower 1/3 of riffle is mainly
cobbles + less embedded

algae on bed + more leaves +
large OM than BH-3

1st benchmark at large sycamore
on left bank - access from
stairs at top of riffle
marked w/pin at base of tree

#2 benchmark - right edge of XSec-4
on concrete slab marked w/red X
concrete embedded in bank [illegible]
surrounded by blackberries → across stream from cottonwood

level set up on right bank
terrace at middle of riffle

bank full difficult to determine
due to large sycamore

11/20/10 200105 549+50

STN	BS	HI	FS	HI	LOW	ELEV	WD	COMMENTS
BM1	3.59	103.59				100.00		spike in base of sycamore on left bank
BM2			4.83					concrete block on rt bank d/s of chestnut (?) + u/s of redwood
XS-1 Head of riffle								Long STN = 4'
4.5'			7.96				0.66	LEW
9			8.03				0.72	
13			7.77				0.43	
18			7.64				0.30	
22'			7.45				0.11	
24.5			7.34					REW
27.7			6.59					soil bank
Long STN = 9' Crest of riffle								
11.4			7.77				0.43	
17.6			7.54				0.19	
Xse - 2								Long STN = 13.7
XS-2			3.59					LTOP OF PIN
1.2'			6.06					Base of Sycamore root
3'			7.09					TOP OF SMALL BANK
3.8			7.96				0.18	LEW

11/20/0 200105 549+50

level - BJM
rod - SC

STN	BS	HI	FS	HI	LOW	ELEV	WD	COMMENTS
XS-2 (cont.)								
6'			7.65					TOP OF COBBLE
7.3'			8.07				0.45	AMONGST SMALLER COBBLES
9.4			8.06				~~0.67~~	0.44 : BASED ON FORE SHOT (FS)
10'			7.47					TOP OF PIECE OF RIPRAP
12.1'			7.96				0.37	AMONGST COBBLES
14.1			7.76				0.22	
16.1			7.61					TOP OF PIECE OF RIP RAP
18.1			7.81				0.24	Gravels
20.1			7.60				0.06	Edge of cobble
22.1			7.63				0.10	gravels
24			7.49					REW
26			6.77					Top of riprap on bank
28			6.75					Bare bank
30.4			5.27					
32			4.29					bank slope at base of ancient flood deposit Flood deposit consists of large rounded gravels
34.3			2.27					bottom of Pin XS-2
			2.06					XS-2 Top of pin

11/20/0 200105 549+50

STN	BS	HI	FS	HI	LOW	ELEV	WD	COMMENTS
XS-3	- middle of riffle							LONG STN= 26.5'
XS-3			2.62					L top of pin
XS-3			2.84					base of pin
1.9			4.69					base of cut bank below Surface then extends [illegible]
3.3			5.55					
4.9			6.68					
6			7.22					top of bank - bank littered w/ imbricated gravels
6.6			7.97				0	LEW
8.1			8 18				0.44	Amongst large gravels
10.1			8 56				0.59	" " "
12.1			8.43				0.41	Amongst gravels
14.1			8 23				0.23	" "
16.5			7.92					on TOP OF SMALL COBBLE
18.1			8.09				0.13	gravels
20.1			8.07				0.10	gravels
21.1			7.45					top of boulder size rip rap
22.1			8 00				0.07	
24.7			7 94					REW gravels
27			7.57					base of rip rap
28.6			6.48					rip rap
31			5.70					top of rip rap

11/20/10 200105 549+50

STN	BS	HI	FS	HI	LOW	ELEV	W.D	COMMENTS
XS-3 (cont.)								
35'			4.41					bare bank
37.2			3.35					base of flood deposit
39.7			1.02					base of pin
39.7			0.87					R top of pin
XS-4 TOE OF RIFFLE								LONG STN = 47.3
XS-4			5.25					L TOP OF PIN
XS-4			5.49					base of pin
2'			6.03					
3'			6.66					flat sandy surface behind cottonwood
5.2'			7.06					edge of flat surface
6.1			7.82					base of old log
7.5			8.80					LEW
9'			8.82				0.09	top of cobble
10.6'			9.20				0.52	amongst cobbles
12.1			9.07				0.46	" "
13			8.77				0.16	top of cobble
14.1			9.03				0.32	large gravels
16.1			9.05				0.37	" "
18.5			8.82					top of rip rap
20.1			9.06				0.24	
21.6			8.87					REW Start of rip rap bank w/ elderberries

11/20/10 200105 549+50

STN	BS	HI	FS	HI	LOW	ELEV	WD	COMMENTS
XS-4 (cont)								
23.1			7.72					on rip rap
25.2			6 43					" " "
27.3			4.84					R XS-4 on X [illegible]
TOE CREST OF RIFFLE LONG STATION :						52'		
XS-5 Below base of riffle								Long Stn - 57
5.5'			9.01					LEW
13'			9.65				0.73	
15'			9.66				0.79	
16.3			8.96					REW on rip rap
XS-6 2nd below base of riffle								Long STN = 60'
6.1			8.94					LEW
11'			10.10				1.20	
13'			10.27				1.39	
15.2			10.07				1.15	
15.3			8.97					REW rip rap
BM-1	3.60	103.60				100.00		
BM-2			4.83					

AFTER REVIEWING THE RIFFLE WE DECIDED TO ADD ONE MORE X-SEC. ABOVE X-S 1 - IT WILL BE MONUMENTED AND WILL BE XS 0-0'

549+50

XS 0-0' LONGITUDINAL STN = -4.95'

11/20/00

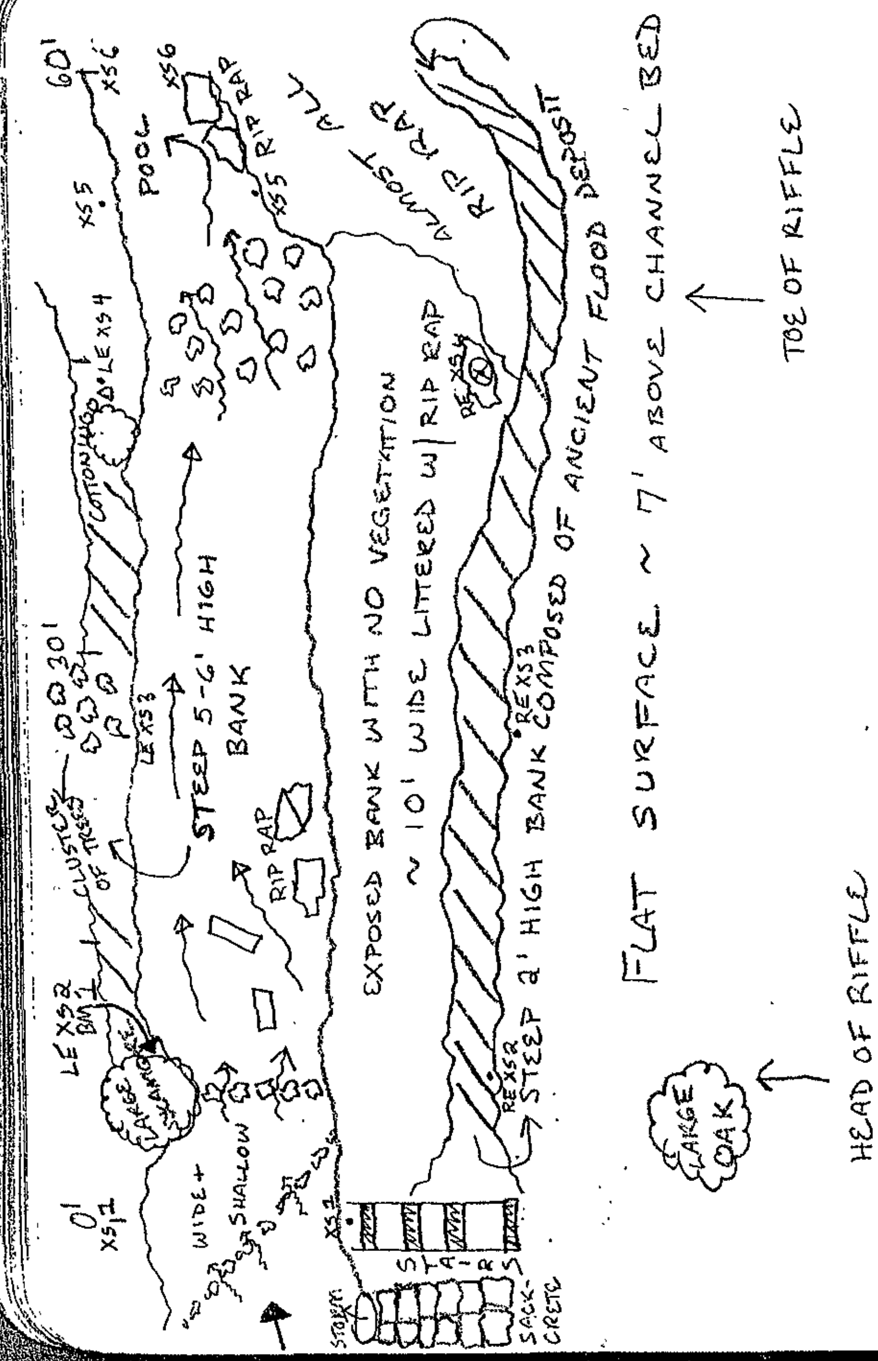
STN	BS	HI	FS	HI	LO	ELEV	WD	COMMENTS
BM 1	3.59	103.59				100.00		
BM 2			4.83					
XS 0								PIN Behind tree
3'			5.99					
5'			6.66					top of root
5.9			7 32					LEW
8'			7 54				0.23	large gravels
10'			7 63				0.33	large gravels
12'			7.61				0.30	
14			7 62				0 33	large gravels + sm cobbles
16'			7.60				0.34	" " " "
18'			7.55				0.29	" " " "
20'			7 53				0.26	" " " "
22'			7.49				0.22	gravels
24'			7 42				0.22	"
26'			7.41				0.21	small cobbles + large gravels
28'			7.43				0.21	" " " "
30.8			7.23					REW
33			6.56					soiled slope
37.2			4.21					R ON NAIL

Nail is in stair. 3rd stair from bottom

BM 1	3.59
BM 2	4.83

SM = MAP

BM = DISCHARGE MEASUREMENT



200105 549 + 50

PHOTOS (ROLL A) 11/20/00

A6: SHOT LOOKING DS FROM TOP OF RUN, BM DOING Q MEAS. 5' U.S. OF HEAD OF RIFFLE

A7: SHOT LOOKING DS FROM STAIRS

A8: SHOT OF BASE OF FLOOD DEPOSIT HOLDING UP PLAIN ABOVE MINI-SLEDGE FOR SCALE

A9: BM STANDING VERY SHALLOW RUN ABOVE THE HEAD OF THE RIFFLE - THIS AREA SEEMS VERY PROBLEMATIC

A10: BM STANDING IN POOL BELOW BASE OF RIFFLE

A11: SHOT @ BASE OF RIFFLE LOOKING UPSTREAM

LEFT SITE 1645: DROVE TO FREMONT ROAD BRIDGE

11|20|00

TODAY'S HOURS

SHAWN 5:00 - 6:30 PM

BONNIE 5:30 - 6:30 PM

3/4 HOUR B-FAST

1/2 HOUR LUNCH

SHAWN 12 1/4 HRS.

BONNIE 11 3/4 HRS.

11/21/0 200105 BJM, SC

cloudy, cold (45° F)

7:30 arrive at Homestead Rd site
(Rosgen bank stabilization)

light rain started at 7:58

stream bed mixed gravels, cobbles +
some boulders or boulder
sized concrete rip rap.

BM1 - left edge of table top
Rosgen boulder immediately
u/s of u/s most rootwad
on right bank
marked w/ red X
BM2 - on left bank below
unkn tree marked w/ PIN
↳ ? Magnolia

200105

11/21/00

stream bed very embedded

some clays in right bank in
stream

water clear

11/21/0 200105 Homestead Rd (Rosgen)

200105

11/21/00

STN	BS	HI	FS	HI	LOW	ELEV	WD	COMMENTS
BM1	4.53	104.53				100.00		table top boulder u/s of uppermost rootwad near base [illegible] ? tree on left bank
BM2			4.82					
XS-1	Pool at head of riffle							long STN = 6.3'
8.2			9.06					LEW
10'			9.37				0.33	gravel
12			9.41				0.34	"
14			9.34				0.30	gravel + v. coarse sand
16			9.15				0.12	on cobble
18'			9.35				0.36	v coarse sand
20'			9.80				0.75	~~cob~~ large gravel
22			10.05				1.02	pocket of v. coarse sand
24			10.06				1.00	on cobble
26.2			9.07					on boulder REW

boulders continue to a height at [illegible] ft stabilizing bank cobbles seem to be [illegible] embedded by v. c. [illegible] sand

11/21/0 200105 Homestead Rd (Rosgen)

200105

11/21/00

STN	BS	HI	FS	HI	LOW	ELEV	WD	COMMENTS
XS-2	Crest of riffle							Low STN = 18'
16.7'			9.42				0.34	on cobble [illegible] of riffle
19.4			9.43				0.37	
XS-2 below crest of riffle								Long STN 24'
XS-2			4.82					L top of [illegible] (BM-2) bank [illegible] of [illegible]
XS-2			[illegible].18					L bottom of [illegible]
[illegible]			6.23					Moun[illegible] [illegible]
6'			7.29					
7.[illegible]'			7.72					top of bank supp[illegible]
8.1			9.31					LEW
10'			9.66				0.36	gravels
12'			9.58				0.25	on cobble
14'			9.35				0.64	very coarse sand
16'			9.21					on rip rap
18'			2.99					on rip rap, [illegible])
20'			9.41				0.33	
22'			9.42				0.25	amongst [illegible]
24'			9.11					on cobble

11/21/0 200105 Homestead Rd (Pasgen)

200105

11/21/00

STN	BS	HI	FS	HI	LOW	ELEV	WD	COMMENTS
XS-2 (cont)								
26'			9.41				0.26	Cobbles
28'			9.08					on cobble
29.8'			9.04					REW
30'			7.96					on boulder
34'			5.50					" "
36'			8.32					R XS-2 pt on boulder below oak
XS-3 - Middle of riffle								LONG STN = 44.6'
XS-3			6.70					L top of PIN
XS-3			7.05					bottom of PIN
2'			7.36					
4'			8.01					
4.8'			8.69					top of bank.
5.'			10.04				0.38	LEW
8'			9.81				0.18	on cobble
10'			10.16				0.56	amongst cobbles
12'			10.19				0.55	
14'			9.68				0.08	on cobble
16'			9.88				0.30	
18'			9.74				0.19	on gravels
20'			9.68				6.15	" "

11/21/0 200105 Homestead Rd (Ro[illegible]) SF [illegible]

200105

11/21/00

STN	BS	HI	FS	HI	LOW	ELEV	WD	COMMENTS
XS-3 (cont)								
22'			9 20					on cobble
24'			9 74				0.22	w/in small [illegible] structure
26'			9 91				0.40	
28.4'			9 84				0.30	REW below [illegible]
29.8			6.80					on boulder [illegible] [illegible]
30.6'			5.66					base of [illegible]
32.2'			2.47					R XS-3 [illegible] a boulder

Reach is about 30% embedded w/ coarse sand

STN	BS	HI	FS	HI	LOW	ELEV	WD	COMMENTS
XS-4 Toe of riffle								LONG. STN= 59.5'
XS-4			6.70					L Top of pin (Backsight [illegible])
XS-4			7.11					base of pin
2'			7.28					
4'			7.76					
5			8.40					
6.2'			9.62					base of bank
8.4'			9.85					upper end of bar
9.2'			9.99					LEW
10.5'			9.85					on cobble
12'			10.33				0.39	
13.5'			10.40				0.41	
15'			10.44				0.39	cobbles
16.5'			10.25				0.14	gravels

200105

11/21/00

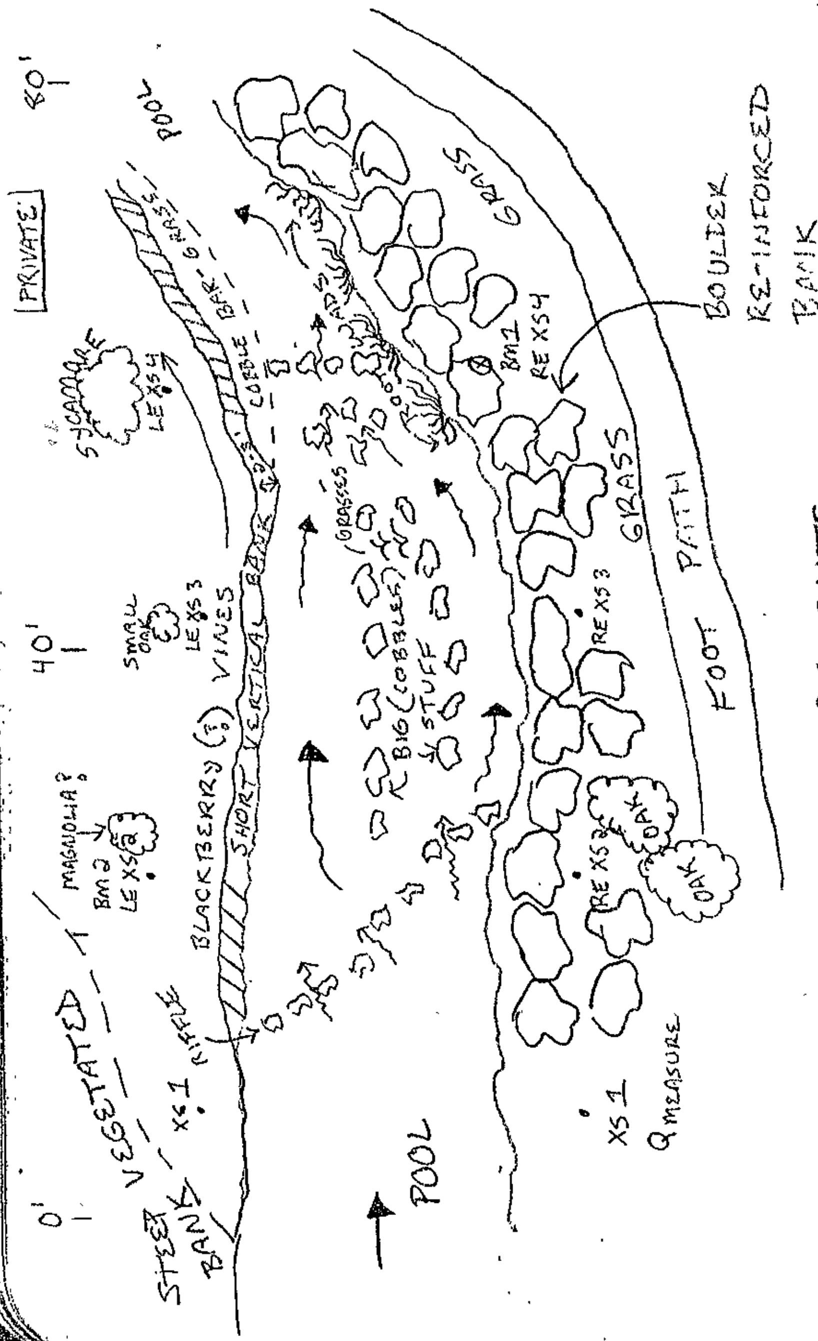
11/21/0 Homestead Rd (Rosgen) 200105 SC, BJM

STN	BS	HI	FS	HI	LOW	ELEV	WD	COMMENTS
XS-4 (cont)								
18'			10.03					on cobble
19.5'			10.13				0.08	gravels
21'			10.05					on gravels
22.5'			10.08				0	base of small step
24'			9.74				0	gravels
25.1			9.74					REW
26.3'			9.67					base of bank - [illegible] [illegible]
27'			7.58					top of bank
28			6.70					
30			5.87					base of boulder
30.1			4.54					R XS-4 (BM-1)

DOWNSTREAM END RIFFLE: VERY ROUGH

STN	BS	HI	FS	HI	LOW	ELEV	WD	COMMENTS
XS-5 - below riffle								LONG STN = 74.3
6'			10.67					LEW
8.5'			11.04				0.37	
11			11.37				0.72	coarse sand
13'			11.53				0.86	next to boulder
15'			11.44				0.82	on [illegible]
17.2			10.84				0.15	REW [illegible]
BM-1	4.54	104.54				100.00		
BM-2			4.82					

END OF RIFFLE LONGITUDINAL STATION: → 69'



200105

PHOTOS (ROLL A) 11/21/20

A12: PHOTO OF REACH U.S. OF RIFFLE CREST BM - Q meas.

A13: PHOTO LOOKING DS @ RIFFLE REACH. BM - Q meas

A14: PICTURE OF RIFFLE STRUCTURE. AND BANK STABILIZATION EFFORTS. W/ TRIPOD FOR SCALE

A15: PICTURE OF BED MATERIAL @ HEAD OF RIFFLE

A16+17: PICTURE LOOKING DS @ RIFFLE, BM NEAR TOE OF RIFFLE

A18: LOOKING UPSTREAM @ RIFFLE FROM POOL BELOW

LEFT SITE @ 10:30 AM

LUNCH 10:45 - 11:30 AM

ARRIVED @ FREMONT ST 11:50 AM

11/21/0 200105

Fremont Rd Bridge Site

- finish set up at 12:32
- light rain
- large crayfish in pool above riffle
- many small (1-2") fish in split pool above + in right side of riffle
- partially breached dam leading to right side of riffle

- water clear, lots of litter

- bed: algae covered, [illegible] [illegible] relatively [illegible] bedded

at 13:30 - water began to discharge from pipe u/s of bridge on left bank at approx rate of 2 gpm
discharge is soapy

WATER BECAME MURKY AND BROWN AFTER RAIN

11/11/10 200105 Fremont St

STN	BS	HI	FS	HI	LEW	ELEV	WD	COMMENTS
BM-1	2.13	102.13				100.00		Base of oak tree u/s of Bridge [illegible]
BM-2			4.91					Base of oak d/s of Bridge [illegible]
XS-1 - Pool above riffle								LONG STN = 17.6
6.5			4.32					top of bank
7.6			4.87					base of bank
12.6			4.96					LEW gravel bar
17			5.19				0.23	gravels
22			5.39				0.44	
26			5.70				0.75	cobbles
28.5			5.98				1.04	
32.9			6.[illegible]				0.80	edge of water
34			4.95					REW
XS-2 - head of riffle								LONG STN = 20.9
XS-2			2.12					top of pin
XS-2			2.39					base of pin
3'			3.43					sandy bank
6			4.17					top of bank
7.1			4.98					base of bank
10.8			4.97					LEW
12			5.01				0.[illegible]	gravels
14			5.12				0.16	"

1.17.10 200105 Fremont St bridge , B'm

STN	BS	HI	FS	HI	LOW	ELEV.	WD	COMMENTS
XS-2 (cont)								
16'			5.15				0.20	gravels
18'			5.33				0.38	gravels, thalweg
20'			5.10				0.27	cobbles + gravels
22			5.22				0.28	" "
24			5.41				0.49	"
26.8			5.00					secondary riffle crest
29			5.11				0.04	on cobble
30			5.60				0.18	base of riffle crest
32			5.72				0.25	cobble/gravel bar
34			5.92				0.20	" " "
36			5.97				0.25	" " "
38			6.02				0.17	" "
40			6.23				0.21	" " "
42.3			6.76				0.40	edge of bar
43.8			7.17				0.79	
44.8			7.07				0.70	LE concrete platform
45			6.07					Concrete sack
46			5.48					R XS-2 concrete platform
XS-3 - Middle of riffle #1								LONG. STN = 56.2
XS-3			3.84					L Top of Pin
XS-3			3.95					[illegible] of pin

11/21/0 200105 Fremont St. bridge SC, BJM

STN	BS	HI	FS	HI	LOW	ELEV	WD	COMMENTS
XS-3 (cont.)								
2			4.36					sandy bank
3.2			4.74					top of bank
4			5.75				0.31	base of bank
5.5			5.82				0.33	cobble + gravel
7			5.80				0.32	" "
8.5			5.68				0.20	" "
10			5.54				0.08	
11.4			5.44				0	edge of gravel/cobble bar
13			5.15					
15			4.99					gravel
17			4.86					"
19			4.70					"
21			4.74					"
23			4.97					" + small cobbles
25			5.08					" " "
27			5.39					" " "
29			5.47					" " "
31			5.55					" " "
33			5.60					on cobble
35			5.91					gravel
37			6.37					"
39			6.51					on cobble

11/21/0 200105 Fremont St. bridge [illegible] BJM

STN	BS	HI	FS	HI	LOW	ELEV	WD	COMMENTS
XS-3 (cont)								
38.8			6.65					LEW
41			6.93				0.29	
42			6.98				0.32	gravel
43			6.76				0.10	on cobble
44			6.83				0.20	gravel
45.2			6.84				0.19	PFW
45.4			5.87					concrete surface
XS-3 end - 46.0			5.49					end of XS-3 concrete
XS-4 - Middle of riffle #2								LONG. STN = 115.5
XS-4			1.03					top of pin
XS-4			1.49					side of pin
2'			2.02					dirt slope
5			2.91					" " (0.8-0.5 [illegible])
7'			3.45					" "
10.5			4.59					top of bank
11.5			5.67					bank slope
12			6.10				0.24	LEW
13.4			6.87				0.7	
15			6.65				0.49	gravels
16.5			6.41				0.22	"
18			6.30				0.1	"

11/21/0 200105 Fremont St. bridge JS, JM

STN	BS	HI	FS	HI	20W	ELEV	WD	COMMENTS
XS-4 (cont.)								
19.6'			6.19					REW edge of bar
21			5.64					bar slope
22.6			5.06					top of gravel bar
25			5.21					gravel
28			5 42					"
30.6			5.74					RE top of bar
33			6.65					LEW
35			7.20				0.52	gravels
37			7 46				0.80	gravels
39			7 65				1.00	on cobble
41			7.85				1.20	cobbles
43			7.74				1.08	gravels
45			7.45				0.80	
45 3			6 66					REW
47			6.31					gravel + cobble bank
49			5 49					
51			4 91.					cobbled slope
53			3.86					base of pin
54.7			2.55					top of pin R XS-4
XS-4			2.07					

11/21/0 200105 Tremont St bridge Sr, ESM

STN	BS	HI	FS	HI	LOW	ELEV	WD	COMMENTS
XS-5	end of riffle							LONG. STN = 156.9
XS-5			4.91					top of pin
XS-5			5.13					base " "
2'			6.13					sandy surface
4			6.64					" " + edge of gravel
6			6.82					gravels
8'			6.93					"
9.2			6.98					LEW
11			7.09				0.15	gravel
13'			7.29				0.39	"
15			7.31				0.38	"
17			7.18				0.30	"
19			7.19				0.28	"
21			6.87					on small cobble
23			7.08				0.20	gravels
25.4			6.87					REW
27			6.51					gravels + sm. cobbles
29			5.84					gravels
31.5			5.10					approx. bank toe
33			4.39					sandy surface
34.4			3.52					base of pin R XS-5
XS-5			3.11					top of pin R

64 | 11/21/0 | 200105 Fremont St bridge | SC, BJM

field notes 65

STN	BS	HI	FS	HI	LOW	ELEV	WD	COMMENTS
XS-6	toe	of	riffle					LONG. STN = 190.5
XS-6			4.76					L top of pin in cut bank
0.8'			7.61					base of cut bank
1.6			8.37				0.31	LEW
3'			8.52				0.44	gravels
4'			8.50				0.39	" * embedded ≈50%
5'			8.48				0.41	gravels
6'			8.45				0.38	" + coarse sand
7			8.25				0.15	" " "
7.8			8.06					REW
9			7.77					gravel bar
11			7.43					on cobble
13			7.44					gravels + cobbles
15			7.27					gravels w/coarse sand in between gravels
17			6.99					gravels
19			6.39					gravel bank
21			5.74					
24			4.87					base of pin R
XS-6			4.47					top of pin

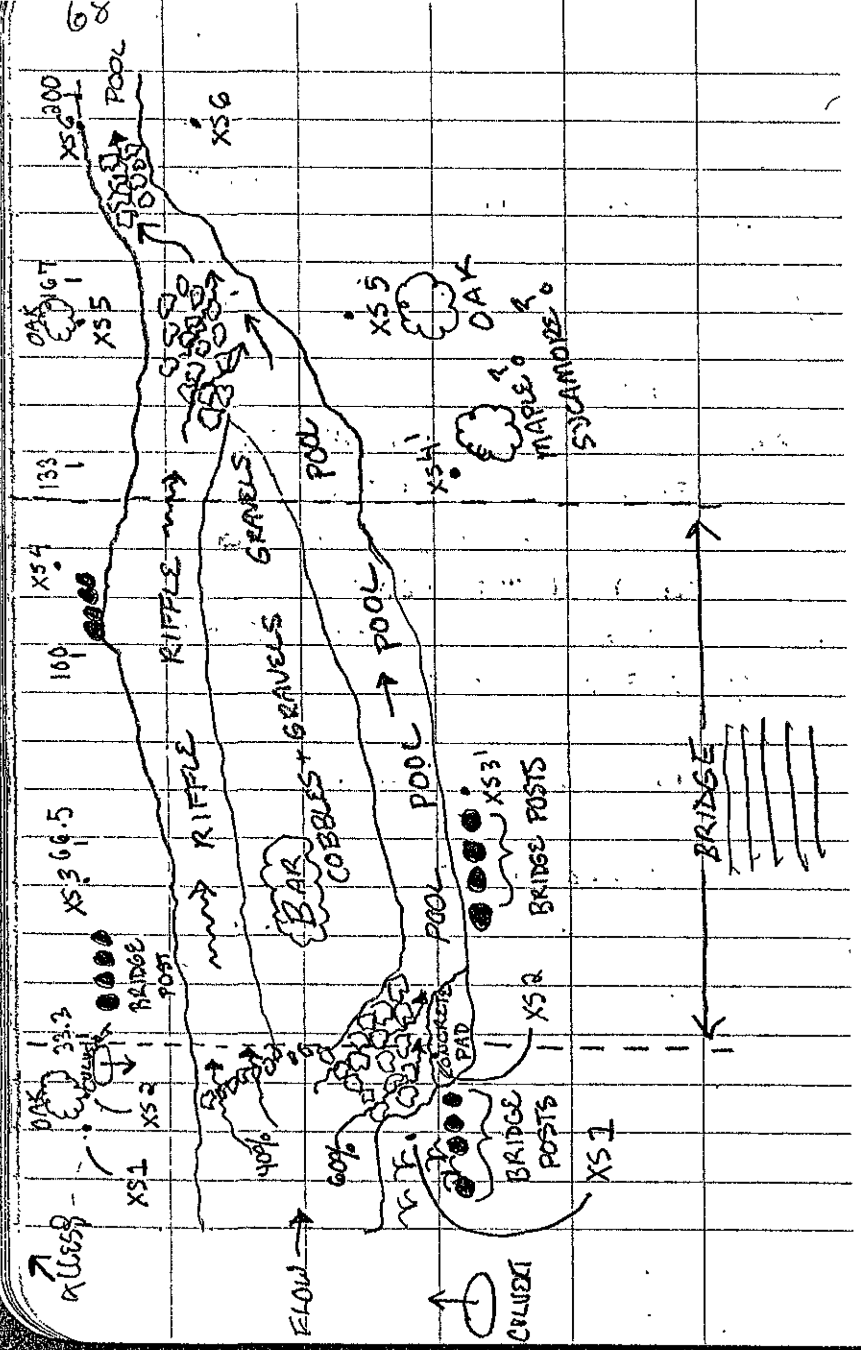
BOTTOM OF RIFFLE @ STN. 195.4'

11/21/0 200105 Tremont St. Bridge

STN	BS	HI	FS	HI	LOW
XS-7	pool	below	riffle		
1.8			8.57		
3.8			8.99		
4.8			8.90		
5.2.			8.80		
7			8.82		
10.2					
BM-1	2.13	102.13			
BM-2			4.90		

SC, BJM

ELEV	WD	COMMENTS
		LONG. STN = 200'
	0.31	
	0.7	
	0.58	
	0.48	
	0.51	
		REW unable to site
		(leaves + branches)
100.0		



PHOTOS (ROLL A) 11/21/00

A19: } LOOKING DS @ HEAD OF RIFFLE
A20:

A21: LOOKING US @ HEAD OF RIFFLE NOTE HOW FLOW SPLITS

A22: LOOKING DS THROUGH RIGHT HAND REACH

A23: LOOKING DS THROUGH LEFT HAND REACH

A24: LOOKING DS, BM IN POOL @ END OF REACH

END OF ROLL

LEFT SITE @ 3:50 PM

DROVE TO EL CAMINO REAL BRIDGE

11/21/00

EL CAMINO REAL BRIDGE

4:00 PM

PHOTOS (ROLL B)

B1: SHOT LOOKING U.S. FROM BRIDGE, BM STANDING ON DRY EDGE OF CONCRETE CHANNEL, NOTE POOL BEHIND HER

B2: SHOT OF STAGNANT POOL US OF BRIDGE

B3: SHOT OF REACH DS OF BRIDGE, ~ ½ CFS DISCHARGING

B4: LOOKING U.S. @ EL CAMINO BRIDGE → NOTE BOULDERS

B5: LOOKING U.S. BELOW BRIDGE

B6: SHOT NON-MOVING POOL

B7: SHOT OF POSSIBLE PASSAGE PROBLEM SITE, IMMEDIATELY DS OF WATER LAST SEEN

LEFT SITE @ 5:30 PM

DINNER 5:30 - 6:30

ARRIVED HOME - 8:30 PM

TODAY'S HOURS

SHAWN 7:00 - 8:30
BONNIE 7:00 - 7:30

1 HOUR LUNCH
1 HOUR DINNER

SHAWN : 11 ½ HRS
BONNIE : 10 ½ HRS

11/30/00 200105 SC, BJM

Clear skys ≈ 50°F

- Steep Chestnut riffle
= removed Kid dam, water level in pool dropped ~ 1 ft.

S.C. < LEFT BERKELEY 5:45 AM
ARRIVED S.J. 7:30 AM

B-FAST: 7:30-8:15

ARRIVED CHESTNUT PICNIC LOT 8:30 AM

TODAY:

a) SURVEY STEEP RIFFLES @
- CHESTNUT PICNIC
- McCLELLAN RANCH

b) SHOOT POOL POINTS @ BH3 + McCLELLAN

c) SITE VISIT TO JOB 200126 JOHN PARMORE ?

11/30/00 200105 BJM, SC Group chestnut

STN	BS	HI	FS	HI	LOW	ELEV	WD	COMMENTS
BM-1	4.80	104.80				100.00		top of spike Alder tree
BM-2			2.78					RE of XSEC # Bay tree
XS-1 → 3sc								Long. Stn.: 20.2' → 29.2 sc
XS-1 2'			7.84				1.6	LEW steep channel bank
4'			7.76				1.52	
6'			7.53				1.28	
8'			7.14				.90	small gravels
10'			6.77				.52	
12'			6.74				.49	
14'			6.72				.46	
16'			6.68				.42	
18'			6.71				.45	small gravels
20.7'			6.71				.46	REW
bed covered in algae, sm. gravels 50%						embedded, coarse gravels 10-20%		
XS-2 → 4sc crest of riffle								Long. Stn: 31' → 40 sc
22.8'			6.57				.27	on cobble
17'			6.65				.32	
XS-3 → 2sc upstream most XSec - in pool								LONG STN 1' → 10 sc
			9.05				2.79	
XS-4 → 1sc in w/s pool								LONG STN: -9' → 0 sc
			9.04				2.79	

1/30/00 | 200105 | SC, DJM | steep chestnut

STN	BS	HI	FS	HI	LOW	ELEV	WD	COMMENTS 46 SC
XS-5	top of riffle							LONG STN: 37'
XS-5 L			1.94					top of nail nail in tree root
2'			4.24					steep bank of old deposit
4'			5.17					"
6'			6.20					base of bank
6.6'			6.32					LEW on gravels
8'			6.34				0	on leaves
10'			6.50				.16	gravels + leaves
12'			6.58				.23	
14'			6 65				.26	gravels
16'			6.74				.35	below cobble
18'			6 74				.32	
20'			6.77				.33	amongst gravel
22'			6.98				.32	
24			6.42					on cobble
26			7.24				.57	gravels
27.8			6.71				0	REW behind log jam
28.5			5.80					top of bank on root
30			5.33					on root
32			4.80					
34.9			4.23					Redge of XS-5 base of pin
			4.03					top of pin

78 | 1/30/00 | 200105 | SC, DJM | eep chestnut

58.3 SC

STN	BS	HI	FS	HI	low	ELEV	WD	COMMENTS
XS-6								LONG STN 49.31
XS-6 L			2.99					top of pin left
XS-6 L			4.05					base of pin at base of step bank
2'			4.80					gravels & leaves
4'			5.17					" "
6'			5.72					
7.7'			6.07					edge of bank
9'			6.83				0	LEW base of bank
11'			6.92				.01	gravels
13'			7.02				.11	
15'			6.94				.05	on gravels
17'			6.92				0	on gravel
19'			7.28				.23	
21'			7.53				.46	gravels
23'			7.65				.60	
25'			7.65				.69	
26.6			7.12				.06	REW
28			6.03					top of bank, below root
30			4.86					
32			4.32					bare soil
36'			3.31					R edge of XS-6 base of pin
36'			~~2~~ 2.66					top of pin

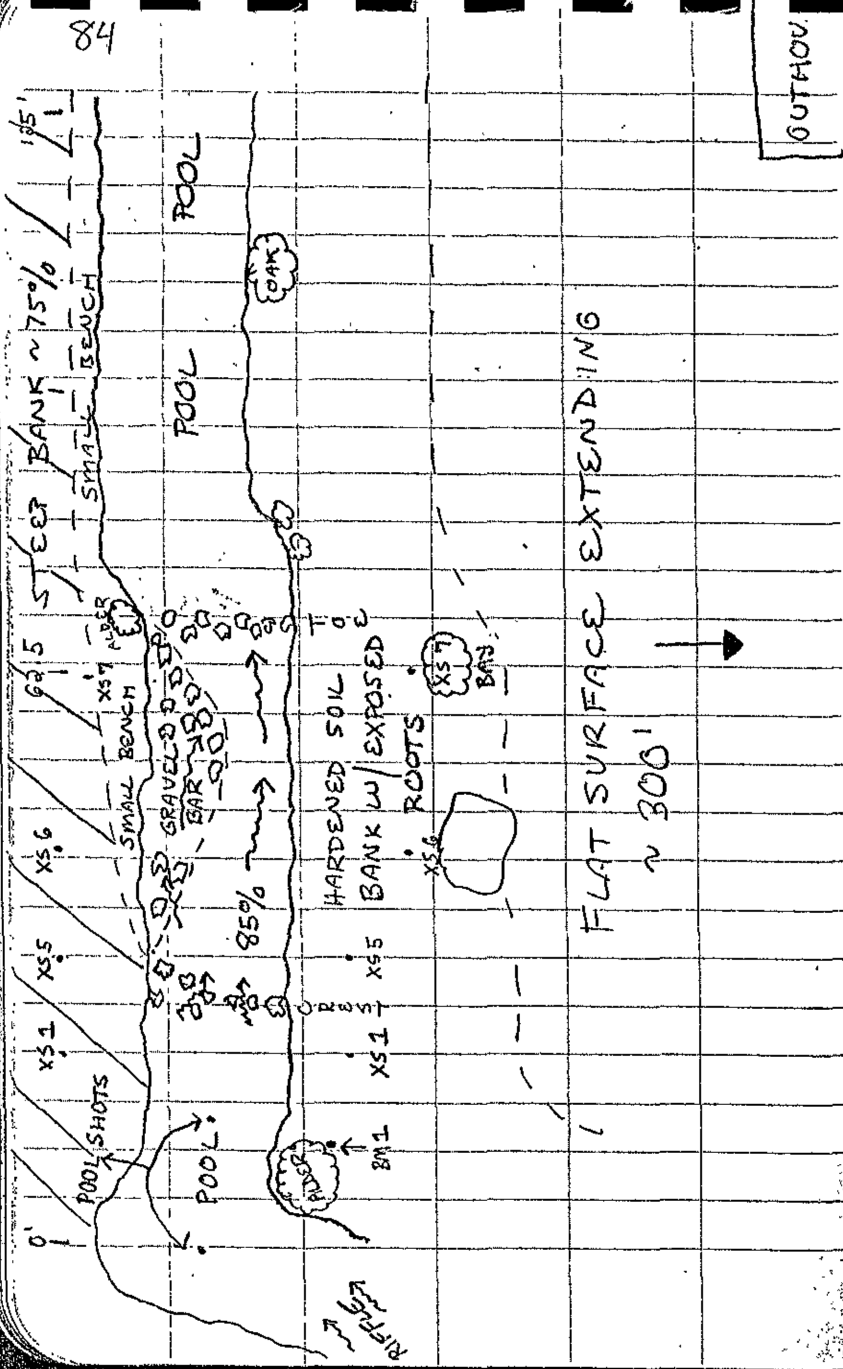
11/30/00 200105 Ste Chestnut

STN.	BS	HI	FS	HI	LOW	ELEV	WD	COMMENTS
XS-7								LONG STN 60.2' → 69.2 sc
XS-7			3.98					top of pin ℄
XS-7			4.38					℄ base of pin
1			4.66					approx bankfull
3'			5.13					gravels + roots
5'			5.43					" "
7'			5.80					"
9'			6.20					" "
11'			6.80'					decending bank
12.3'			7.58				.12	LEW
14'			7.68				.14	
16'			7.73				.20	cobbles + gravels
18			7.81				.32	"
20'			7.85				.39	" "
22'			8.02				.51	" "
24'			7.80				.29	" "
24.9			7.61				.12	REW
26			6.18					top of bank
28			5.35					bare soil + roots
30.8			4.55					↓R edge of XSe-7 base of pin below bay tree
33.9			3.11					↓top of pin
XS-7			2.77					BM-2

riffle extends to 69' → 78 sc

02 1113010 200105 chestnut

STN	BS	HI	FS	HI	LOW	ELEV	W.D	COMMENTS
XS-8								LONG STN: 75-8 → 84.8
5.2			8.22				.44	LEW SC
8			9.70				1.90	
10			9.88				2.11	
12			9.97				2.19	
14			9.68				1.91	
16			9.46				1.70	
17.9			8.40				.64	REW
XS-9								LONG STN 100 → 109
thalweg			9.88				2.12	SC
XS-10								LONG STN 115 → 124
thalweg			9.36				1.60	SC
BM-1	4.79	104.79				100.00		
BM-2			2.77					



PHOTOS (ROLL B)

B17: SHOT LOOKING U.S., BM IN POOL
SHOT FROM POOL

B18: SHOT LOOKING D.S. THRU
RIFFLE, SHOT FROM POOL

B19: " " SHOT FROM RIGHT BANK

B20 - B22: BM IN LOWER POOL,
PANNED SHOT OF POOL → RIGHT
BANK

4/30/00 2001 05 AND BELOW

STN	BS	HI	FS	HI	LOW	ELEV	WD	COMMENTS
BM-1	3.79	103.79				100.00		unknown tree (maple?)
								Q ≈ 3-4 cfs guess
BM-2			5.72					on rock
XS-1 - above riffle								LONG STN 62' → 43 (Crest of riffle at LONG STN=0')
thalweg			6.82				.90	
XS-2 above riffle								LONG STN 85' → 20
thalweg			7.22				1.35	
XS-3 above riffle								LONG STN = 105' → 0
thalweg			7.28				1.40	
XS-4 above riffle								LONG STN = 50' → 55
thalweg			6.70				.79	
XS-5 - below riffle								LONG STN 59' → 164
thalweg			7.97				.55	
XS-6 below riffle								LONG STN 68' → 173
thalweg			8.57				.85	
XS-7 below riffle								LONG STN 88 → 193
thalweg			8.98				1.15	
XS-8 - below riffle								LONG STN 102 → 207
thalweg			9.14				1.32	
XS-9 - below riffle								LONG STN 114 → 219
thalweg			9.08				1.22	
BM-1	3.79							
BM-2			5.72					

11/30/00 200125

① LEAST EXPENSIVE ALTERNATIVE

② LEAVE EXISTING WORK

③ WANTS TO MAKE AMENDS - ECONOMICALLY

1 HOUR TRAINING (1:15 - 2:15)

PHOTOS

B24

C1-

STN	BS	HI	FS	HI	LOW
BM-1	3.29	103.29			
BM-2			4.52		
tape at crest of dam = 0'					
XS-1	3-3' S.C.		7.66		
XS-2	2-2'		7.42		
thalweg			8.85		
XS-3	1-1'		8.85		
XS-4	15-15'		11.01		
XS-5	14'-14		12.03		
XS-6	13-13' S.C.		11.05		
XS-7	12-12'		10.71		
XS-8	11-11'		9.91		
BM-1	3.29	103.29			
BM-2			4.52		

ELEV	WD	COMMENTS
100.00		base of large tree
		rock. S.C.
	.93	Long stn = 32' above crest of riffle → 64'
	.71	LONG STN 65' → 31'
	2.13	thalwag of long stn=65' (XS-2)
	2.14	LONG STN = 96' → 0'
	1.31	LONG STN = 93' below crest of riffle → 189'
		thalweg
	2.34	LONG STN = 83' → ~~147'~~ 179' thalwag
	1.38	LONG STN = 72' → ~~136'~~ 168' thalweg
	1.02	LONG STN = 65' → ~~129'~~ 161' thalweg
	1.10	LONG STN = 55' thalweg → ~~119'~~ 151'
100.00		

.92 /0 200. M llar S, BJL

15:45

STN	BS	HI	FS	HI	LOW	ELEV	WD	COMMENTS
BM-1	5.03	105.03				100.00		RE of XS-3
BM-2			4.57					LE of XS-4
w/s of	1-1'		7.66				0.39	LONG STN = 5
riffle	2-2'		9.95				2.64	LONG STN = 14
	3-3'		10.51				3.19	LONG STN = 22
	4-4'		9.43				2.12	LONG STN 32
XS-1 5-5'								LONG STN = 41
2.9			7.32					LEW
6			8.18				.87	
9			8.19				.89	gravels
12			8.28				.98	
15			8.39				1.10	
18			7.97				.66	
21.6			7.34				.03	REW
Crest of riffle 6-6'			7.94				.66	LONG STN = 51.4 thalwag
								many leaves in crest
XS-2	7-7'							LONG STN = 58
XS-2			4.56					L top of pin
			5.02					bottom of pin
1.9			5.65					top of bank rootmass
2.6			7.65				.06	base of bank LEW

11/30/00 | 200105 | Sierp McClellan

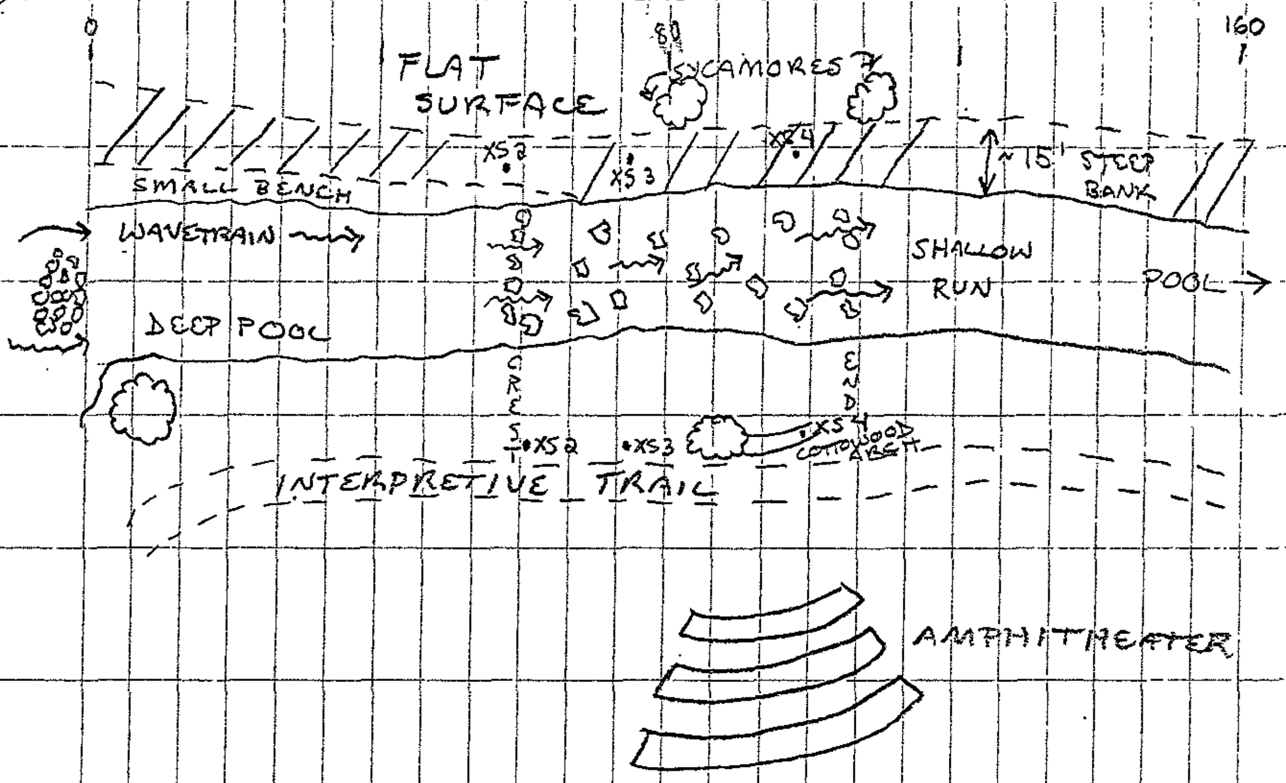
STN	BS	HI	FS	HI	LOW	ELEV	V	WD	COMMENTS
XS-2(cont)									
4			7.91					.34	
6.8			7.58						top of riprap
10			8.85					.44	amongst gravels + sm. cobbles
12			8.94					.50	behind cobble
15			7.55					.15	on piece of rip rap
18			8.04					.64	cobbles
21.4			7.40						REW
24			6.61						gravel covered bank sand underneath
27.3			5.13						R base of pin
27.3			4.82						top of pin
XS-3	8-8'								LONG STN= 70.6
			4.42						L top of pin
			4.81						base of pin
1.4			5.99						top of bank elderberry root mass
2			7.92					0	base of bank LEW
4			8.33					.45	amongst gravels
6			8.17					.27	on rip rap
8			8.33					.46	
10			8.20					.31	behind boulder
12			8.07					.22	in riffle
14			7.74					0	on cobble

7/30/00 200105 Skip McClellan

STN	BS	HI	FS	HI	LOW	ELEV	WD	COMMENTS
XS-3 (cont)								
16			8.22				.52	gravels
18			8.01				.29	
19.3			7.73					REW
20.6			6.96					top of bank
23			6.19					
25.4			5.31					R base of pin
25.4			5.03					top of pin
XS-4	9-9'							LONG STN = 94.2
			4.57					L top of pin
			5.11					base of pin
1.6			7.09					top of bank
3.4			8.68				.27	LEW, base of bank, rootwad
5			8.91				.49	amongst large gravels
7			8.69				.26	behind rip rap
9			8.75				.42	
11			8.87				.47	large gravels
13			8.75				.37	
15			8.44				.10	on cobble
17.3			8.37					REW
19			7.56					gravel covered bank, sand beneath
21.3			6.64					below fallen tree

11/ 10 01 [illegible]

STN	BS	HI	FS	HI	LOW	ELEV	WD	COMMENTS
XS-4 (cont)								R end of XS-4 unable to sight
23.6								
end of riffle at → 105'								LONG STN = 105
XS-5	10-10'							LONG STN = 112.5
1			9.24				.76	LEW
3			9.20				.72	
5			9.24				.75	gravels
7			9.20				.73	
9			9.21				.74	
11			8.89				.43	
14.1			8.44					REW
d/s of			9.20				.67	LONG STN = 128 thalweg
riffle			9.76				1.23	LONG STN = 147
"			10.57				2.00	LONG STN = 161
BM-1	5.03	105.03				100.00		
BM-2			4.57					


0
80
160
FLAT SURFACE
SYCAMORES
SMALL BENCH
XS2
XS3
XS4
~15'
STEEP BANK
WAVETRAIN
SHALLOW RUN
POOL
DEEP POOL
CREST
END
XS2
XS3
XS4
COTTONWOOD ABSENT
INTERPRETIVE TRAIL
AMPHITHEATER

COYOTE # 5

Balance Hydrologics, Inc.
900 Modoc
Berkeley, California 94707

Project No. 200105
Gage No.
Stream COYOTE CREEK
Location TULLY BRIDGE
Date 01 26 01

Conditions and Observations

Observer(s): GP, SC
Weather & Conditions: PTLY CLOUDY
Temperatures: MAX FORECAST FOR TODAY 55°F RAIN LAST ~48 HRS
Hydrograph: ☐ Raising ☒ Falling ☒ Uncertain ☐ Baseflow
If falling, approximate time of previous peak:

Procedures X~SECTION ALSO SHOT HERE

Measurement at: LONGITUDINAL STATION 22
Method: [✓ 0.6] 0.2/0.8 Other
Meter No. AA SN 900914
Spin Test: 90+
Suspension: [✓ Rod] Cable
Measurement rated: Excellent (±2%) Good (±5%) Fair (±8%) Poor ( )

Gage Heights

Time	Staff	Other

Observed High-Water Marks

Approx. Gage Height	Est. date

Remarks water is muddy brown. Max visibility 0.2 ft

Hydraulic Geometry

Area:
Width: Top Bed
Depth:
Velocity:
Slope:

Crest Stage Data

Observed Crest G.H.
Adjustment: NO GAGE
Adjusted Crest G.H.:
Remarks:
Reset Repair

Coefficients Utilized and Explanation: N/A

Changes in conditions since last visit? NO CHANGE IN CHANNEL

Concurrent water quality, sediment or biological measurements/sampling conducted

Discharge Measurement Notes

	Coeff.	Station	Width	Flow Depth	Obs. Depth	Revs.	Secs.	Velocity At point	Velocity Avg.	Horiz. or Vert. Adjust.	Area (ft²)	Discharge (cfs)	Bed*
1059	REW	29.7											
		28	1.85	0.53	S	4	41	.23	.18		.98	.18	S,G
		26	2	0.62	S	8	36	.50	.40		1.24	.50	
		24	2	0.75	S	7	30	.53	.42		1.50	.63	
		22	2	0.87	0.6	9	34	.60			1.74	1.04	
		20	2	1.12	0.6	10	35	.64			2.24	1.43	
		18	2	1.34	0.6	12	44	.61			2.68	1.63	
		16	2	1.42	0.6	8	31	.58			2.84	1.65	
		14	2	1.30	0.6	11	33	.75			2.60	1.95	
		12	2	1.23	0.6	14	36	.87			2.46	2.14	
		10	2	0.85	0.6	12	31	.86			1.70	1.46	C
		8	1.65	1.20	S	11	35	.71	.57		1.98	1.13	
11:19	LEW	6.7											
				1.02				.589					

S = SURFACE MEASUREMENT

13.74 cfs gpm

*Bed Key: M (Mud, Muck), S(Silt, Sand), G(Gravel), C(Cobbles), B(Boulders), BR(Bedrock), RP(Riprap), CON(Concrete), FP(Floodplain, Overbank), Other

Hecht 3/88

Computations

Date: By: Reviewed:

Balance
Hydrologics, Inc.

Gage No.
Stream COYOTE CREEK
Location SITE 3
Date 011801

Conditions and Observations

Observer(s) GP, SC
Weather & Conditions SUNNY, MILD
Temperatures: 40-60
Hydrograph: ☐ Rising ☐ Falling ☐ Uncertain ☒ Baseflow
If falling, approximate time of previous peak

Procedures

Measurement at LONGITUDINAL STATION 91.0
Method: [✓ 0.6] 0.2/0.8 Other
Meter No. AA SN: 500914
Spin Test 90+
Suspension: Rod Cable
Measurement Rated Excellent [✓ (±2%)] Good (±5%) Fair (±8%) Poor ( )

Gage Heights

Time	Staff	Other

Observed High-Water Marks

Approx. Gage Height	Estimated Date

Remarks

Hydraulic Geometry

Area
Width: Top Bed
Depth
Velocity
Slope

Crest Stage Data

Observed Crest G.H.
Adjustment
Adjusted Crest G.H.
Remarks
Reset Repair

Coefficients Utilized and Explanation

Changes in conditions since last visit?

Concurrent water quality, sediment, or biological measurements/sampling conducted

Discharge Measurement Notes

Coeff.	Station	Width	Flow Depth	Obs. Depth	Revs.	Secs.	Velocity At pt.	Velocity Avg.	Horiz. or Vert. Adjust.	Area	Discharge	Bed*
LEW	9.0											Roots, Sand
	12.0	2	0.60	S	0	—	0					S
	13	1	1.02	0.6	5	42	.28			1.02	.29	S
	14	2	1.32	0.6	12	33	.81			2.64	2.14	S,G
	17	3	1.35	0.6	10	36	0.63			4.05	2.55	SGB
	20	3	1.12	0.6	15	51	.66			3.36	2.21	S
	23	3	1.02	0.6	10	32	.70			3.06	2.14	S
	26	3	0.86	0.6	10	31	.72			2.58	1.86	S,C
	29	3	0.92	0.6	10	42	.54			2.76	1.49	
	32	3	1.35	0.6	10	42	.54			4.05	2.18	
	35	3	1.38	0.6	~~10~~ 12*	~~37~~ 32*	.84			4.14	3.48	
	38	3	1.29	0.6	7	35	.46			3.87	1.78	
	41	3	1.08	0.6	10	32	.70			3.24	2.27	
	44	3	0.98	0.6	7	32	.50			2.94	1.47	
	47	2.5	0.87	S	5	32	.36			2.18	.78	
REW	49											
			1.17				.595					

1116 △
LWD U/S
LWD D/S
△ 1143

SAME AS COYOTE 1 Totals 24.64 CFS

*Bed Key M (Mud, Muck), S (Silt, Sand), G (Gravel), C (Cobbles), B (Boulders), BR (Bedrock), RP (Riprap), CON (Concrete), FP (Floodplain, Overbank), Other

Hecht 3/88

Computations

Date 01/19/01 By SML Reviewed

Balance Hydrologics, Inc.
900 Modoc
Berkeley, California 94707

THIRD LONGITUDINAL SECTIO

Project No. 200105
Gage No.
Stream COYOTE CREEK
Location SITE 1
Date 01 17 01

Conditions and Observations

Observer(s): GP, SC
Weather & Conditions: SUNNY, COOL, LAST RAINS ~7 DAYS AGO
Temperatures: ~45-55
Hydrograph: ☐ Raising ☐ Falling ☒ Uncertain ☐ Baseflow
If falling, approximate time of previous peak:

Procedures

Measurement at: 3rd longitudinal cross section
Method: [✓ 0.6] 0.2/0.8 Other
Meter No. AA 500914
Spin Test: 90+
Suspension: Rod Cable
Measurement rated: [✓ Excellent] (±2%) Good (±5%) Fair (±8%) Poor ( )

Gage Heights

Time	Staff	Other
—	—	
—	—	
—	—	

Observed High-Water Marks

Approx. Gage Height	Est. date

Remarks WATER IS SLIGHTLY MILKY

Hydraulic Geometry

Area:
Width: Top Bed
Depth:
Velocity:
Slope:

Crest Stage Data

Observed Crest G.H.
Adjustment:
Adjusted Crest G.H.:
Remarks:
Reset Repair

Coefficients Utilized and Explanation:

Changes in conditions since last visit?

Concurrent water quality, sediment or biological measurements/sampling conducted

Discharge Measurement Notes

	Coeff.	Station	Width	Flow Depth	Obs. Depth	Revs.	Secs.	Velocity At point	Velocity Avg.	Horiz. or Vert. Adjust.	Area (ft²)	Discharge (cfs)	Bed*
11:27	REW	32.8	—										
		30.0	2.9	0.72	0.6	10	38	0.59			2.09	1.23	SG
		27.0	3	1.26	"	15	35	0.95			3.72	3.53	SG
		24.0	2.25	1.28	"	15	30	1.11			2.88	3.20	SG
		22.5	1.5	1.35	"	15	30	1.11			2.03	2.95	SG,C
		21.0	1.5	1.30	"	20	34	1.30			1.95	2.53	
		19.5	1.5	1.15	"	20	30	1.47			1.73	2.54	
		18.0	1.5	1.28	"	25	36	1.53			1.92	2.94	
		16.5	1.5	1.05	"	25	31	1.79			1.58	2.83	
		15.0	1.5	0.94	"	25	36	1.53			1.41	2.16	
		13.5	1.5	0.88	0.6	15	31	1.07			1.32	1.41	
		12.0	1.5	0.45	S	20	34	1.30			0.68	0.88	
11:44	LEW	10.5											
				1.06				1.25				25.5 cfs	
												gpm	

AA METER $V = \frac{REV}{t} \times (2.170)^{*} + 0.020^{*}$

*Bed Key: M (Mud, Muck), S(Silt, Sand), G(Gravel), C(Cobbles), B(Boulders), BR(Bedrock), RP(Riprap), CON(Concrete), FP(Floodplain, Overbank), Other

Hecht 3/88

Computations

Date: 01/19/01	By: SMC	Reviewed:

>40 REVS USE 0.030 2.180 } <40 USE 0.020 2.170

Discharge form.xls,Q Form

Balance Hydrologics, Inc.
900 Modoc
Berkeley, California 94707

COYOTE 4

Project No. 200105
Gage No. —
Stream COYOTE CREEK
Location COYOTE 4
Date 01 2601

Conditions and Observations

Observer(s): SMC, GP
Weather & Conditions: COOL, CLOUDY, LIGHT RAIN
Temperatures: 55°F
Hydrograph: ☐ Raising ☐ Falling ☑ Uncertain ☐ Baseflow
If falling, approximate time of previous peak: RAIN IN LAST 24 HOURS

Procedures

Measurement at:
Method: [✓ 0.6] 0.2/0.8 Other
Meter No. 900914
Spin Test: STRONG @ 60 SEC'S
Suspension: Rod Cable
Measurement rated: Excellent (±2%) Good [✓ (±5%)] Fair (±8%) Poor ( )

Gage Heights

Time	Staff	Other
N/A		

Observed High-Water Marks

Approx. Gage Height	Est. date
N/A	

Remarks GOOD X-SECTION, FAIRLY LAMINAR FLOW
SHOULD GET GOOD Q CALC.

Hydraulic Geometry

Area:
Width: Top Bed
Depth:
Velocity:
Slope:

Crest Stage Data

Observed Crest G.H.
Adjustment:
Adjusted Crest G.H.:
Remarks:
Reset Repair

Coefficients Utilized and Explanation:

Changes in conditions since last visit?

Concurrent water quality, sediment or biological measurements/sampling conducted

Discharge Measurement Notes

	Coeff.	Station	Width	Flow Depth	Obs. Depth	Revs.	Secs.	Velocity At point	Velocity Avg.	Horiz. or Vert. Adjust.	Area (ft²)	Discharge (cfs)	Bed*
3:27	LEW	0											
		2	2	1.02	0.6	3	60	.13			2.04	.27	
		4	2	1.05	0.6	15	60	.57			2.10	1.20	
		6	2	1.15	0.6	24	60	.89			2.3	2.05	
		8	2	1.04	0.6	16	60	.60			2.08	1.25	
		10	2	.81	0.6	26	60	.96			1.62	1.55	
		12	2	1.12	0.6	29	60	1.07			2.24	2.40	
		14	2	1.04	0.6	28	60	1.04			2.08	2.16	
		16	2	1.00	0.6	30	60	1.11			2.00	2.22	
		18	2	0.80	0.6	24	60	.89			1.60	1.42	
		20	2	0.68	0.6	15	60	.57			1.36	.77	
		22	2	0.70	S	12	60	.46	.36		1.40	.50	
		24	1.5	0.40	S	4	60	.17	.14		0.60	.08	
3:50 pm	REW	25											
				0.90				0.69					
												15.8 cfs	
												gpm	

*Bed Key: M (Mud, Muck), S(Silt, Sand), G(Gravel), C(Cobbles), B(Boulders), BR(Bedrock), RP(Riprap), CON(Concrete), FP(Floodplain, Overbank), Other

Hecht 3/88

Computations

Date:	By:	Reviewed:

200105

01/10/01

Q_{MEAS} BEGAN: 1:15 PM
Q_{MEAS} FINISH: 1:45 PM

* HAD TO RESTART Q MEASUREMENT TWICE BECAUSE OF LEAVES DAMS UPSTREAM WHICH BLEW AND DISRUPTED THE CURRENT METER

* FLOW IN X-SEC 1 ON RIGHTSIDE OF CHANNEL WAS GREATLY AFFECTED BY RIP-RAP (SUPERCRIT FLOW)

→ LARGE BRANCH FROM LIVE OAK ON RIGHT BANK CAME DOWN DURING MEASUREMENT

200105

01/17/01

COYOTE CREEK 1

200105

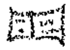
FIELD NOTES

GUSTAVO PORRAS
SHAWN CHARTRAND

B:FAST ½ HOUR
LEFT BERKELEY: 5:30 AM
ARRIVED MORGAN HILL 6:45 AM
ARRIVED COYOTE 1: 7:40 AM

$Q_{EST.} \cong 20-25$ CFS
WEATHER: CLEAR SKIES, COLD (40°F)
WATER: FAIRLY CLEAR
BED MATERIAL: FINE PEBBLES (1-2cm)
TO COBBLES (20-30cm)
COVERED IN ALGAE
10-20% EMBEDDED

SURVEY BEGAN: 9:00 AM
SURVEY FINISHED: 11:00 AM

GUSTAVO: , 
SHAWN:

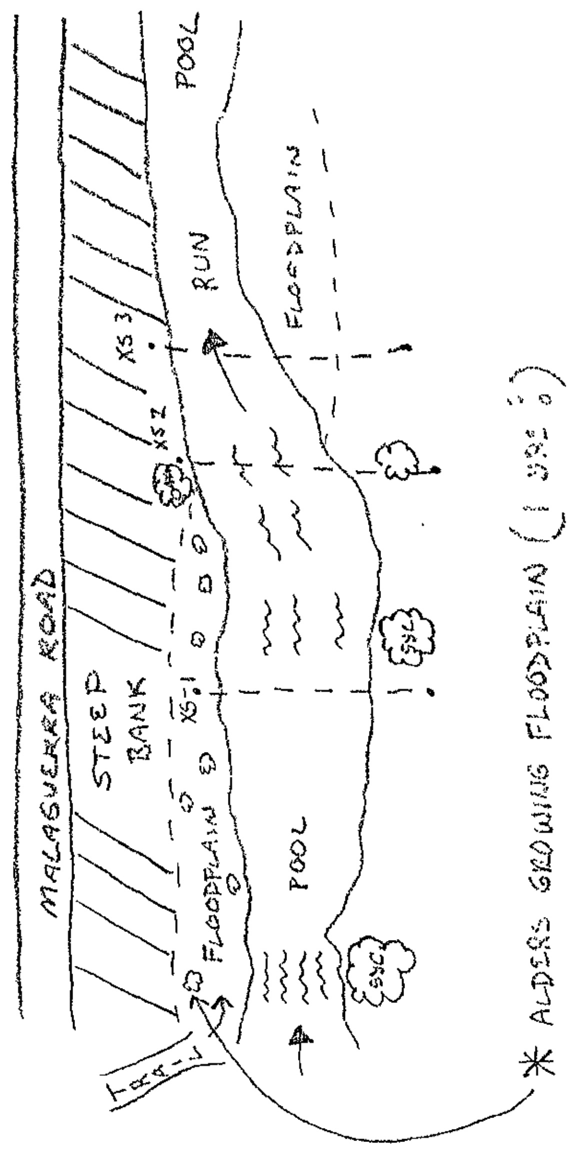
SHAWN: GPS ENDPOINTS
GUSTAVO: DISCHARGE MEASUREMENT
@ THE 3RD X-SECTION

GPS NOMENCLATURE

FILE (ROVER) NAME: COYOTE 1

XS 1 LE, RE
XS 2 LE, RE
XS 3 LE, RE
LONG. PROFILE: XS 1
LONG PROFILE: XS 2
LONG PROFILE: XS 3
TBM 1

- LEFT COYOTE 1 @ 12:15 PM FOR COYOTE 2.



200105

01/17/01

COYOTE CREEK 2

- SAME COMMENTS AS PREVIOUS LOCATION

- FLOW SPLITS IN TWO HERE

VERY PROBLEMATIC!

BEGIN SURVEY 13:00 PM

GP, SMC,

$Q_{XS\ 1\text{-}1} = Q_{COYOTE\ 1}$

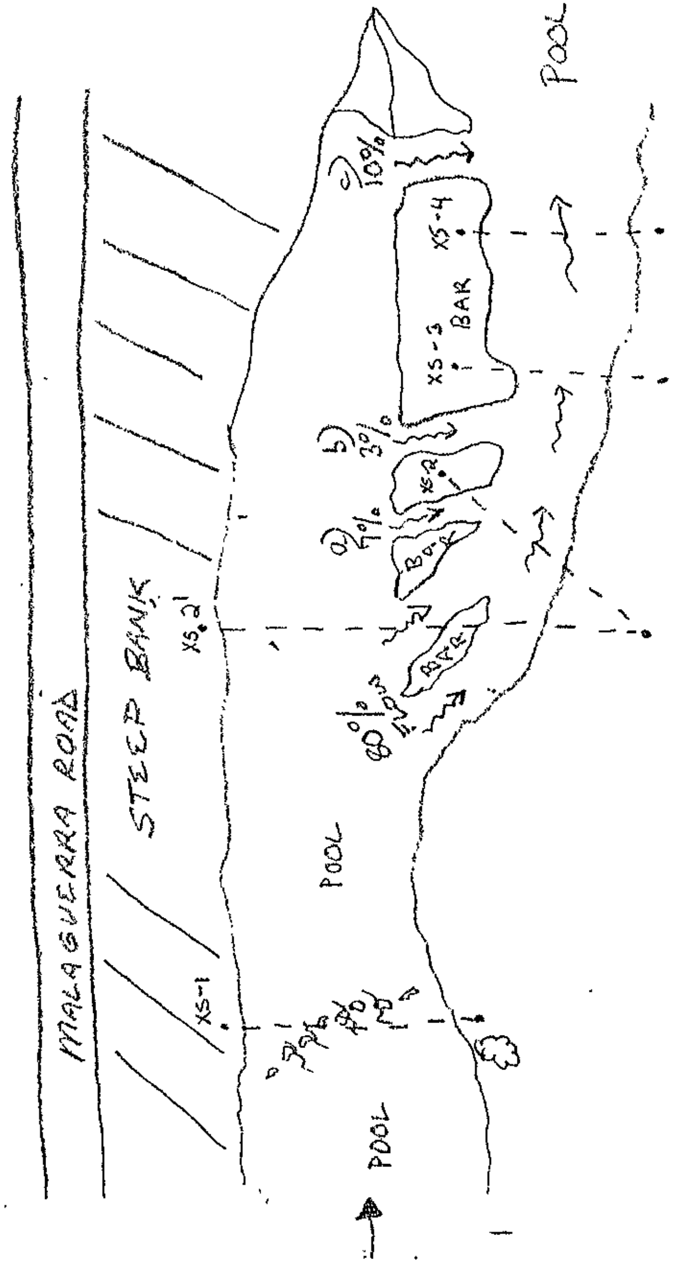
$Q_{XS\ 2'\text{-}2} = Q_{COYOTE\ 1}$

$Q_{XS\ 2\text{-}2} = Q_{COYOTE} \times (0.80)$

$Q_{XS\ 3\text{-}3} = Q_{COYOTE} \times (0.90)$

$Q_{XS\ 4\text{-}4} = Q_{COYOTE} \times (0.90)$

DISCHARGE NOT TAKEN B|C WE ARE ONLY 1/5 OF MILE D|S OF COYOTE 1



LOCATION

a) FLOW TEST:

1. 10' 5.0 SEC
2. 10' 3.81 SEC
3. 10' 3.04 SEC

DIMENSIONS : 3' × 0.3' DEEP

c)

1. 10' 5.44 SEC
2. 10' 3.31 SEC
3. 10' 3.69 SEC

DIMENSIONS : 4' × 0.85' DEEP

GP + SMC : GPS ENDPOINT LOGGING

LEFT COYOTE 2 @ 5:20 PM
FOR MOTEL IN MORGAN HILL

200125

01/18/01

COYOTE CREEK 3

GUSTAVO PORRAS
SHAWN CHARTRAND

ARRIVED : 7:30 AM
Q_{EST} : 30-32 CFS
WEATHER : CLEAR SKIES, COLD
~ 35°F (FROST LAST NIGHT)
WATER QUALITY : FAIRLY CLEAR

COMMENTS :

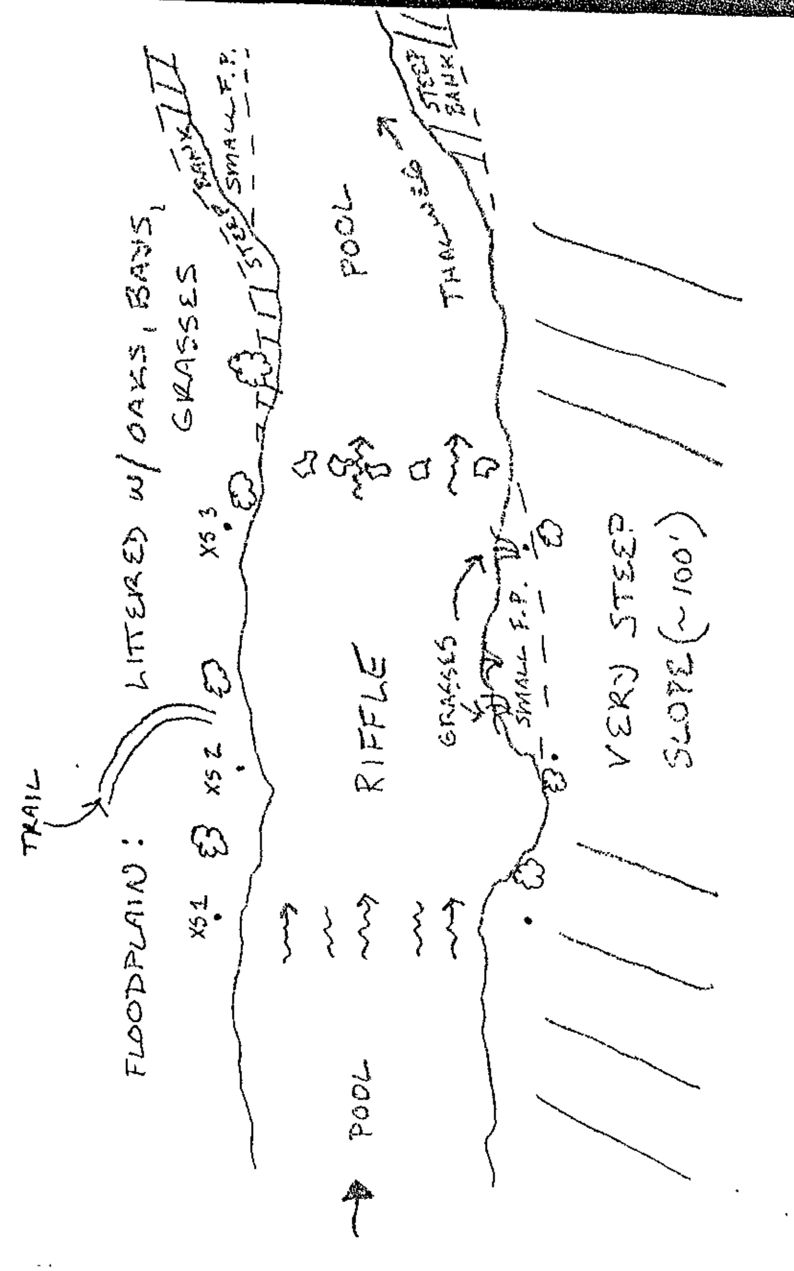
- LARGE, WIDE RIFFLE, FAIRLY STABLE WITH ADJACENT FLOODPLAIN
- OAKS AND BAY TREES WITHIN RIPARIAN ZONE, TALL GRASSES AS WELL
- NUMEROUS BI-VALVE SHELLS LITTERED ON THE CHANNEL AND FLOODPLAIN

GP: , , DISCHARGE MEAS.

SMC: , LONG, LAT

CHANNEL IS MORE STABLE IN THIS REACH, POOLS ARE WELL-DEVELOPED GEOMETRICALLY

DEPARTED: 12:05 PM



January 17 2001, wednesday
SC, GP - SUNNY, COOL, LAST RAINS ~ 7 DAYS AGO
COYOTE CREEK
SITE ①

STATION	BS	HIGHT	FS	ELEV.	REMARKS
TBM1				100.0	
	4.08	104.08			
TBM2	3.19				
2.0			3.15		TOB
7.5			4.64		LEW
15.0			7.99		Thlwg
32.6			4.70		Rew
40.0			2.61		TOB
0			3.21		TOB
5.9			4.60		LEW
14.4			8.06		Thalwg
32.0			4.68		REW
39.5			2.75		TOB
3.0			3.76		TOB
9.4			4.72		LEW
12.0			5.17		

200,105 01/17/01 - 2
FILE COPY
- FIELD NOTES

longitudinal station ①

Pool

WD = 3.3 ft. 9:16

long station 19.4 XSEC
Pool

Longitudinal station 41.9 XSEC
TOE OF POOL
WD = 0.48

January 17 2001, wednesday
SC, GP - SUNNY, COOL, LAST RAINS ~7 DAYS AGO
COYOTE CREEK
SITE ①

STATION	BS	HIGHT	FS	ELEV.	REMARKS
TBM 1				100.0	
	4.08	104.08			
TBM 2	3.19				
1					
2.0			3.15		TOB
7.5			4.64		LEW
15.0			7.99		Thlwg
32.6			4.70		REW
40.0			2.61		TOB
0			3.21		TOB
5.9			4.60		LEW
14.4			8.06		Thalwg
32.0			4.68		REW
39.5			2.75		TOB
3.0			3.76		TOB
9.4			4.72		LEW
12.0			5.17		

200,105 01/17/01 - 2
FILE COPY
FIELD NOTES

longitudinal station 0

Pool

WD = 3.3 ft. 9.16

long station 19.4 XSEC
Pool

Longitudinal station 41.9 XSEC
TOE OF POOL.
WD = 0.48

STATION	BS		FS	ELEV	
15.0			5.82		
18.0			6.03		
21.0			6.13		
24.0			5.98		
27.0			5.96		
33.1			4.67		REW
37.5			4.01		TOB
LEXS1			3.20		TOPin
			3.43		Bottom Pin
3.0			3.19		ON GRAVEL
6.0			3.37		
9.0			3.50		
12.0			3.94		
15.2			4.85		LEW
18.0			5.31		
21.0			5.34		
24.0			5.30		
27.0			5.20		
30.0			5.42		
33.0			5.56		
36.0			5.94		
39.0			5.88		
42.0			6.35		

011701-4

WD= 1.03
WD= 1.24
WD= 1.38
WD= 1.29
WD= 1.27

FIRST MONUMENTED section LS=59.2
Head of Riffle

"STATION 6 feet"

Edge of flat surface

WD 0.48 gravels & a few lg cobbles
WD 0.49
0.47
WD 0.35
WD 0.66
WD 0.68
WD 1.02
WD 1.09
WD 0.53

43.6	4.83	REW
47.0	4.305	
51.0	3.49	
LEXS2	0.625	TOP
	0.97	BOP
2.0	1.76	
4.0	4.55	
6.0	5.26	LEW
9.0	5.57	
12.0	5.83	
15.0	6.00	
18.0	6.07	
21.0	6.00	
24.0	5.80	
27.0	5.79	
300	5.69	
33.0	5.66	
36.0	5.42	
39.0	5.52	
41.7	5.23	REW
47.4	3.32	
53.0	3.39	BOP
53.0	3.06	TOP

Xsec ends 51.9 CANNOT SEE PIN FROM INST. (tree in the way)

cannot see pin from inst. (tree in the way)

LONG STA. 99.0

ON ROOT

WP = 0.42

= 0.63 10:07

0.80 BED GRAVELS + FEW LG COBBLES

0.87

0.81

0.57

0.60

0.49

0.51

0.20

0.31

RBXS 2

LEXS3	3.83	TOP
	4.04	BOP
2.0	4.91	
4.7	5.65	LEW
7.0	6.515	
9.0	6.515	
11.0	6.57	
13.0	6.49	
15.0	6.41	
17.0	6.25	
19.0	6.08	
21.0	5.95	
23.0	6.11	
25.0	5.90	
28.5	5.54	REW
33.0	4.91	
39.0	4.55	
43.6	3.90	BOP
43.6	3.55	TOP
2.0	4.90	on bank
4.2	591	LEW
7.0	7.03	
9.0	7.09	

01701-8

Long STA 141.1 LEXS3

WD 0.90 BED GRAVELS AND A FEW LG COBBLES
0.89
0.90
0.82
0.79
0.48
0.49
0.38
0.52
0.31

FLAT SURFACE/BRAMBLES
REXS 3

Long stat 170.8 10:37

WD = 1.14
1.22

11.0			6.94		
13.0			6.92		
15.0			6.76		
17.0			6.71		
19.0			6.30		
22.0			6.94		REW
27.0			5.35		
30.0			5.30		
2.6			4.01		
3.60					LEW
8.2			7.44		
13.0			7.25		
17.0			6.95		
24.0			6.51		
30.8			6.13		REW
35.5			5.74		
TBM1			4.08		
TBM2			3.195		

011701-10

WD= 1.11
1.05
0.89
0.81
0.40

Long Sta 234.5
can't see - tree branch on the way
1.30
1.22
0.84
0.38

10:54

LEAVING SITE 1 12:04

COYOTE CREEK SITE 2

STATION	BS	H.I.	FS	ELEV	Remarks
TBM 1	4.35	104.35		100.0	
TBM 2			3.75		
48.0					REW
2.0					LEW
2.0			3.62		LEW
~20			3.67		
~36			4.49		
~40			5.06		
~48			3.50		REW
LE XS1					TO PIN
2.0			3.89		LEW
6.0			5.15		
10.0			5.01		
14.0			4.56		
18.0			4.36		
22.0			4.24		
26.0			4.24		
30.0			4.55		
34.0			4.08		

73

011706-12

@ Xsec 3
on RB Near Xsec 2
Xsec 1, 6

Longitudinal station 11.0

WD = 0.16
WD = 0.98 14:18
WD = 1.55
water SURFACE

Longitudinal sta. 54.8
2.70 upper cross hairs

WD = 1.30
= 1.08
= 0.60
0.59
0.60
0.61
0.94
0.85

STA	BS	HI	FS	ELEV.	
38.0			4.25		
42.0			4.34		
48.0			3.51		REW
51.0			2.93		B of PIN
51.0			2.72		T of PIN
1.0			2.92		T of Root on bank
1.7			4.02		LEW
2.0			5.92		
5.0			6.03		
7.0			6.15		
9.0			5.99		
11.0			5.78		
13.0			5.44		
15.0			4.92		
19.0			4.70		
23.0			4.245		
30.0			3.89		
33.0			4.06		
40.0			3.77		REW
42.5			3.64		

WD= 0.73
0.82

RE XS 1
INDIVIDUAL RIFFLE BED MAT GRAVELS + SMALL COBBLES COVERED W/ALGAE.

Longitudinal STATION 91.4
(Pool @ HEAD OF RIFFLE)

WD= 1.91
2.01
2.19
2.01
1.78
1.43
0.92
0.71
0.25
0.13
0.24

011701-16

LEXS 2' 0.0	2.04	TOPIN
0.0	2.00	B.OPIN
2.0	3.39	Bank
3.8	4.04	LEW
6.0	4.85	
9.0	4.99	
12.0	4.90	
15.0	4.81	
18.0	4.89	
21.0	4.71	
24.0	4.72	
27.0	4.96	
31.0	4.65	
34.0	4.61	
38.0	4.76	
42.0	5.05	
46.0	5.63	
49.0	5.71	
52.0	5.60	
55.0	5.98	
57.8	5.67	REW
62.0	4.89	
71.2	3.92	B.OPIN
71.2	3.75	TOPIN

Longitudinal station 147.0
same Q up to this point as Coyote 1

WD 0.80
0.95
0.85
0.76
0.81
0.62
0.61
0.83
0.46
0.32
0.27
0.28
0.49
0.56
0.22
0.46

REXS 2

LE
XS-2

0.0	4465	TOPIN
0.0	4.70	BOPIN
3.0	4.75	
6.0	5.135	
8.0	549	LEW
10.0	6.085	
12.0	6.29	
14.0	6.20	
16.0	6.30	
18.0	6165	
20.0	594	
22.0	6.23	
24.0	6.56	
26.0	6.57	
28.0	6.33	
30.0	5.71	REW
32.0	5.02	
36.0	4.51	
40.0	4.31	
43.7	3.92	BOPIN
43.7	3.75	

longitudinal Sta 159.0

0.65
0.72
0.64
0.65
0.51
0.26
0.52
0.87
0.89
0.68

REXSZ

15:26

LE XS 3		
0.0	4.35	TOPIN
0.0	4.72	BOPIN
3.0	4.86	
6.0	6.25	
11.0	6.31	
11.6	6.44	LEW
14.0	6.61	
16.0	6.79	
18.0	7.11	
20.0	7.28	
22.0	7.26	
24.0	7.57	
26.0	7.77	
28.0	7.58	
30.9	6.605	REW
34.0	6.00	
37.1	4.63	BOPIN
37.1	4.21	TOPIN

Longitudinal Sta. 2154

Bed mat'l gravels to large cobbles

0.15

0.30

0.62

0.80

0.77

0.84

1.31

1.12

15.38

LEXS400	4.405	TOPIN
00	4.84	BOPIN
3.0	4.88	
6.0	6.15	
8.0	6.88	LEW
10.0	7.40	
12.0	737	
14.0	7.46	
16.0	7.69	
18.0	8.02	
20.0	7.86	
22.0	7.91	
24.0	7.62	
26.0	7.24	
28.0	6.95	REW
31.0	6.20	
34.0	5.58	
38.2	5.13	BOPIN
38.2	4.82	TOPIN

011701-22

Longitudinal sta 246.8

0.50
0.49
0.58
0.83
1.15
1.02
0.99
0.79
0.33

REXS4 -15:50

5.0			662		channel bank
8.0			7.17		LEW
10.0			7.61		
12.0			7.90		
14.0			7.97		
16.0			8.18		
18.0			8.39		
20.0			8.59		
22.0			8.68		
24.0			8.08		
26.0			816		
31.0			748		REW
33.0			592		
6.5			645		channel bank
8.0			7.51		LEW
15.0			8.96		
20.0			941		
25.0			8.94		
28.0			835		
32.5			7.58		Rew
38.0			572		
TBM1			4.355		
TBM2			3.25		

011701-24

Longitudinal Sta. 268.0
Pool below riffle
WD= 0.25
0.42
0.54
0.75
1.01
1.21
1.22
0.70
0.69

Channel bank

Longitudinal sta 299.0

WD= 1.40
1.95
1.40
0.88

1609

January 18 2001 - COYOTE CREEK
GP, SC, clear, cold frost in morning.
SITE 3 7:30
Q est ~ 30 cfs

STATION	BS	IA	FS	ELEV.	Remarks
TBM 1	2.68	102.68		100.0	
TBM 2			4.79	1.79	
2.0			5.57		LEW
22.0			6.77		
36.0			7.74		
44.0			7.50		REW
45.0			4.93		TOB
	———	o	———		
2.0			5.59		LEW
20.0			6.14		
36.0			7.29		
46.0			7.43		
49.0			7.08		REW
51.0			4.56		TOB
	———	o	———		
3.0			5.08		TOB
6.0			5.60		LEW
9.0			6.34		
12.0			6.86		

RE XS 3 8.42

Longitudinal Sta 0
- Pool XS consists of fine gravels to coarse gravels
not imbedded - WD = 1.19
1.91
2.15

——— O ———

Long Sta. 35.0 - XS fine pebbles to v. coarse pebbles + small cobbles,
WD = 0.53 not imbedded.
1.70 - v. coarse sand b/n cobbles
1.84
1.50

——— O ———

long sta 73.0 Pool @ head of riffle
XS D
WD = 0.70
121

011801-4

STA	BS	HI	FS	ELEV	WD	REMARKS
15			6.86		1.23	12
18			6.75		1.13	
21			6.745		1.14	
24			6.815		1.19	
27			6.56		0.96	
30			6.46		0.85	Amongst LWD + BOULDER SNAG
33			6.82		1.20	
36			7.01		1.39	
39			6.69		1.09	
42			7.00		1.38	
47			5.78		0.91	in grasses
48.7			5.63		REW	
52			4.65		channel Bank	
	—	0	—		—	— 0 —
0			4.22		LEXS1 TOPIN	CREST OF RIFFLE @ 111ft
0			4.535		BOPIN	long Sta 130 ft XS1 9:13
3			5.05			
6			5.37			
9.6			5.825		LEW	
12			6.13		0.36	
15			6.57		0.78	
18			6.49		0.72	
21			6.65		0.94	
24			5.95		0.23	on boulder

011801-6

STA	BS	HI	FS	ELEV	WD	Remarks
27			6.39		0.66	
30			6.635		0.92	
33			6.615		0.80	
36			6.53		0.71	
39			6.31		0.55	on lg cobble
42			6.88		1.03	in fallen tree
45			6.61		0.78	"sand"
48			6.70		0.82	
52			5.94		0.10 REW	
54			5.08		ch. bank	
57.2			4.96		BOPIN	
57.2			4.645		TOPIN	9.24
	——— o ———					——— o ———
0			4.78		XS2 TOPIN	Long Sta. 200.4
1			5.075		BOPIN	
3			5.345			Approx. Bank full
6			6.32			
9			6.56		LEW	
12			7.00		0.40	behind boulder
15			6.96		0.40	on cobble
18			7.16		0.56	behind cobble
21			7.26		0.69	
24			7.265		0.65	behind boulder
27			7.425	[illegible]	0.89	

01-1801- B

STA	BS	HI	FS	ELEV	W/D	REMARKS
30			7.16		0.60	
33			746		0.93	
36			6.91		0.35	ON BOULDER
39			7.61		0.95	
42			6.55		—	ON BOULDER
45.9			656		REW	
50			5.88		ch. bank	
54			5.21			
58.6			4.00		BOPIN	
58.6			382		TOPIN	9.49
						Xsec littered w/cobbles + small boulders
	——	——	0 ——			—— 0 ——
0			4.55		TOPIN	Xsec 3 long Sta. 231.0
0			4.68		BOPIN	
5			567			
8			6.64			
10.5			7.33		LEW	
14			781		0.42	
17			7.61		0.25	
20			7.68		0.35	
23			798		0.62	
26			796		0.65	
29			8.145		0.84	

011801-14

4.97	TOPIN	RE XS 3
5.20	TOPIN	RE XS 2

——— 0 ———

——— 0 ———

STA	BS	HI	FS	ELEV	WD
32			821		0.91
35			7.98		0.69
38			7.86		0.62
41			808		0.81
44			804		0.73
47.7			7.24		REW
51			6.06		CH. BANK
55			5.10		BOPIN
55			4.78		TOPIN

— o —

TBM1			2.08		

— o —

TP	5.20				TOPIN
			4.96		TOPIN

— o —

12.0			7.14		TO Bank
13.4			8.23		LEW
15			9.33		1.09
22			9.36		1.10
26			9.45		1.21
30			9.57		1.33
34			9.86		1.61

REXSEZ 3

— o —

10:03

— o —

LEXSZ. From new INST. location

LEXS3

— o —

long station 2634

STA	BS	HI	FS	ELEV	WD
38			10.02		1.79
42			10.12		1.94
46			9.40		1.18
48.1			8.18		REW
49.2			7.30		on bank
		——	o	——	
8			7.36		on bank
9.6			8.26		LEW
12.0			9.52		1.28
20			9.78		1.56
28			10.79		2.57
36			11.14		2.83
40.7			8.25		REW
42			6.85		on bank
		——	o	——	
4.0			7.78		on bank
12.5			8.24		LEW
20			9.53		1.30
26			10.67		2.46
30			11.17		2.95
36			11.14		2.83
40.7			8.25		REW
42			6.85		on bank

011801-12

10:29

—— o ——

long station 291

long Station 310

10:41

200105
012601-2
FIELD NOTES

FRIDAY, JANUARY 26, 2001
C, GP, PTLY CLOUDY, COOL
- MAX Temp today ~ 55°F
- RAIN LAST ~48 HOURS

COYOTE CREEK 5
TULLY ROAD BRIDGE 9AM

STATION	BS	IH	FS	ELEV	WD	REMARKS
TBM	3 26			1000		LEXS 1
			5425			LEXS 2

o ---

0			5 685		°LEW	LEW LONGITUDINAL SECTION 7
8			850		2.38	
22			7.82		2.16	
30			735		1.70	
33			569		°REW	

— o —

6 0			5.67		°LEW	long stat 22
14			7 04		134	
22			663		0 95	
30			5.68		°REW	9·24

— o —

WHITE CREEK 5

012601-4

STATION	BS	IH	FS	ELEV	WD	REMARKS
24.0			5.78		LEW	long station 48
22.8			6.36		0.60	- beginning of bridge abutment
19.0			6.68		0.93	* - need to flip station 18 R-L
17.0			6.675		0.91	
15.0			6.40		0.68	
13			6.28		0.51	
11			6.20		0.48	
9			6.53		0.79	on gravel bar
7			6.91		1.18	
5			6.97		1.25	
1 3			6.75		1.02	bridge pier

— o —

STATION	BS	IH	FS	ELEV	WD	REMARKS
35			3.255		TOP LEXS 1	CREST OF RIFFLE 56.0
35			3.45			Long station 63.5
32			3.865		Bop of Bank	
29			4.095		"	
26.3			4.305		TOBank	
24			5.91		0 LEW	
22			6.33		0.45	
20 *			6.945		0.98	Bed consists of riprap & gravel
18			6.81		0.89	
16			6.50		0.60	
14			6.50		0.54	

01 2001-6

STA	BS	IH	FS	ELEV	WD	Remarks
12			6.565		0.68	
10			6 59		0 69	
8			6.49		0.51	
6			6 19		0.26	
4			6,10		0.23	
2			5 87		0.10	
0.3			6.02		0.20	EDGE OF BRIDGE PIER. 9:53
			— 0 —			(LEXS 2) long sect
0			5.43		TOPIN	
0			5.61		BOPIN	
2			6 125			
3.1			7.07		0 LEW	
5			6.125		.0 –	TOP Log
7			7.485		0 48	
9			7.555		0 52	
11			7.77		0 77	
13			7.72		0 63	d/s of rip rap
15			7 82		0 78	
17			7.77		0.75	
19			7.61		0 54	
21			7.55		0 44	
23.2			7.10		REW	
25			6.765			
28.5			6 76		BOPIN	
28.5			6 53		TOPIN	

012601-8

STA	BS	IH	FS	ELEV	WD	REMARKS
0			4 845		TOPIN	long sta 137.2 ; 10:13
0			4 965		BOPIN	LEXS 3
2			5.77			
3.9			6.56		TOBank	
4.2			7.49		0.2 ~~(LEW)~~	
6			7.92		0 66	
8			8.03		0.71	
10			7.79		0.39	
12			7.72		0.38	
14			7.79		0.43	
16			7.97		0.61	
18			7.91		0.40	d/s of boulder
20			8.11		0.64	
22			8 10		0.65	
24.4			7 47		0 REW	
27.			7.17		on bank	
29.2			7.00		BOPIN	
29.2			6.91		TOPIN	10.23

—o—

STA	BS	IH	FS	ELEV	WD	REMARKS
0			7.99		LEW	long sta 157
4			9.85		1.97	Channel width 8.1 ft.
8.1			8 11		REW	

—o—

012601-10

STA	BS	IH	FS	ELEV	WD	REMARKS	
0			7.99		LEW	long. sta 171	
6			9.95		2.01	ch. width 11.4 ft	
11.4			7 94		REW		

— o —

STA	BS	IH	FS	ELEV	WD	REMARKS	
0			7.96		LEW	long sta 195	
5			9.98		2.02	ch width 10.7 ft	10:37
10.7			8.00		REW		

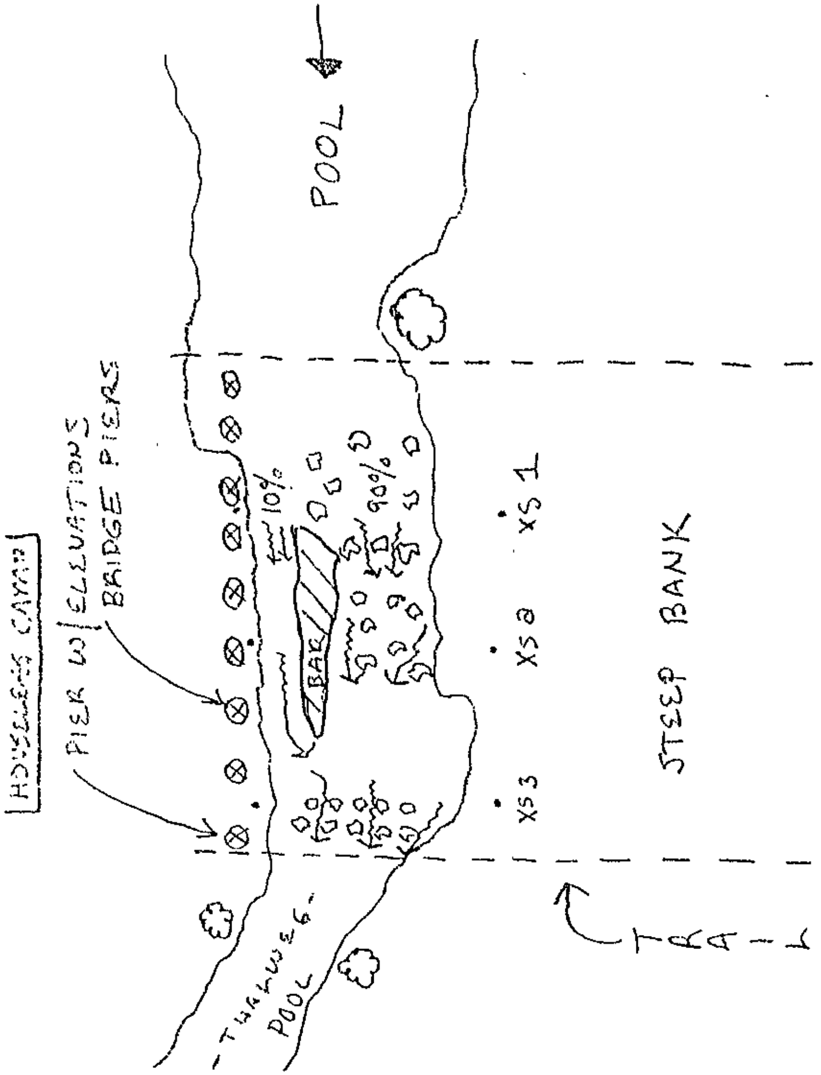
— o —

STA	BS	IH	FS	ELEV	WD	REMARKS	
			5 48			sta. 150 d/s end of pier 8.31 = 1.10 on pier	

— o —

STA	BS	IH	FS	ELEV	WD	REMARKS	
			5 435		TOPIN	LEXS2	
			3 255		TOPIN	LEXS1	10:45

COYOTE 5



012601-12

COYOTE 4 JAN 26, 2001
GP, SC PTLY CLOUDY SCATTERED SHOWERS

NOTES:

012601-14

COYOTE 4

STATION	BS	IH	FS	ELEV.	WD	REMARKS	
TBM 1	6.145			100 00	TOPIN	LEXS 3	13:20
			5.97		TOPIN	REXS 2 (3)	
		— o —					
0 8			686		0.64 LEW	Long. Station 0.0	
3			7.30		1.08		
7			7.27		1.03		
11			6.98		0.74		
15			7.43		1.19		
19			7.15		093		
23			6.92		060		
26			6 25		.REW	Bed consists of gravels/cobbles	
			— o —				
0			6.71		LC 0 42	long Sta 24.0	
3			6.61		0.30		
6			6.73		049		
9			689		062		
12			7 05		078		
15			727		0.96		
18			7.17		093		
21			727		1.04		
24			6.92		1.65		

012601 - 16

STATION	BS	HI	FS	ELEV	WD	Remarks
27			6.88		0.62	
29			6.30		REW	
		— o —				
2.0			6.34		LEW	longitudinal station 54.0
5			6.75		0.38	- CREST OF RIFFLES @ 60 0
8			6.92		0 59	
11			7.05		0.68	
14			7.05		0.66	
17			7.06		0.69	
20			7.085		0.77	
23			7.22		0.82	
26			6 95		0.61	
29			6 92		0.55	
33.1			6.37		REW	
		— o —				
0			5.17		TOPIN	Long Sta 91.0 1353
0			5 79		BOPIN	LEXS 1
3			6 44		Bank	
6.1			6.74		LEW	tall grasses
9			7.32		0 63	
11			7.17		0 58	
13			7 23		0.59	

012601-18

STATION	BS	IH	FS	ELEV	WD	Remarks
15			7.51		0.83	
17			7.37		0.69	
19			7.35		0.66	
21			7.475		0.80	
23			7.33		0.63	
25			7.265		0.54	
27			7.345		0.62	
29			7.33		0.58	
32.5			6.76		REW	- START OF GRAVEL BAR
37			6965		ONGBar	- BAR IS COVERED BY "LETTUCE" LIKE GRASSES
43			7.51		"	- STANDING WATER
49			7.80		ONGBar	
51.8			8.19		0.47	LEW } Account for ~5% OF TOTAL Q
52.6			824		0.59	
54.4			8 01		0.32	
58			758		REW	GRAVELS
64.7			618		BOPIN	
64.7			597		TOPIN	

—— 0 ——

STATION	BS	IH	FS	ELEV	WD	Remarks
0			327		TOPIN	long station 116.0
0			3.71		BOPIN	LEXS 2
1.6			4.16			EDGE OF CUT BANK
2			6.385			Base of cut bank

012601-20

STATION	BS	IH	FS	ELEV	WD	REMARKS
4.5			7.27		0.32	ELW
8 2			7.37		0.43	LEW
11			7.55		0 59	Bed consists of gravels/cobbles.
14			7.46		0.64	
17			7.48		0.52	Behind gravel
20			7365		0.39	
23			7.28		0.28	Descending riffle structure
26			7.38		0.30	
29			7.48		0.34	
32			7.85		0.61	
35			7.83		0 47	
38			8.025		0 44	
41			8.05		0.32	ON SUBMERGED GRASSES
44			8.44		0.73	Base of riffle structure
47			8.36		0.62	
50			808		0.32	
53 6			7.765		REW	
57			715			channel bank - gravels
60.6			6.14		BOPIN	
60 6			5.97		topin	1425

—o—

0			6 14		TOPIN	Long Sta 148.0 1430
0			6.32		BOPIN	

01 2001 - 22

STATION	BS	IH	FS	ELEV	WD	Remarks
5			6.44			ON cobbles
10			651			"
15			6.90			
20			7.28			Willows
25			7.40		–	STANDING WATER
30			7.72		0.15	" "
33			7.96		0.36 LEW	
35			7.66			ON GRAVEL
37			8.01		020	
39			8245		0.38	
41			8405		042	
43			862		047	
45			852		027	
48			884		0.33	EDGE OF HIGH FLOW ZONE
50			9.10		0.61	
52			9.24		0.83	
54			938		1.00	
56			911		0.54	
58			892		046	
60.9			8.47		REW	
65			734			Base of bank
695			632		BOPIN	
695			613		TOPIN	

— o —

- Ranger stops by
- lock combination
either 2000, 2001
1002, 0002

1447

012601 - 24

STATION	BS	IH	FS	ELEV	WD	Remarks
						Long sta 1720 → Riffle ends

— o —

STATION	BS	IH	FS	ELEV	WD	Remarks
3			9 46		LEW	long sta 181.0
6			10 045		0.62	standing water
8 2			10 25		0 83 LEW	
10			10.38		0 99	
12			10 38		1.03	
14			10.61		1.26	
16			10.67		1.30	
18			10 40		1.04	
20			10.05		0 64	
22			9 61		0.20	
24 1			9 41		REW	
25 5			7 81		TOBank	Gravel / cobbles

— o —

STATION	BS	IH	FS	ELEV	WD	Remarks
0			9 51		LEW	Long Station 210.0
5			10 62		1.22	
10			11.13		1.74	
18			11 56		2.16	
24			11 08		1.68	
27.9			9 43		Rew	
29 5			7.95			Middle bank 1508

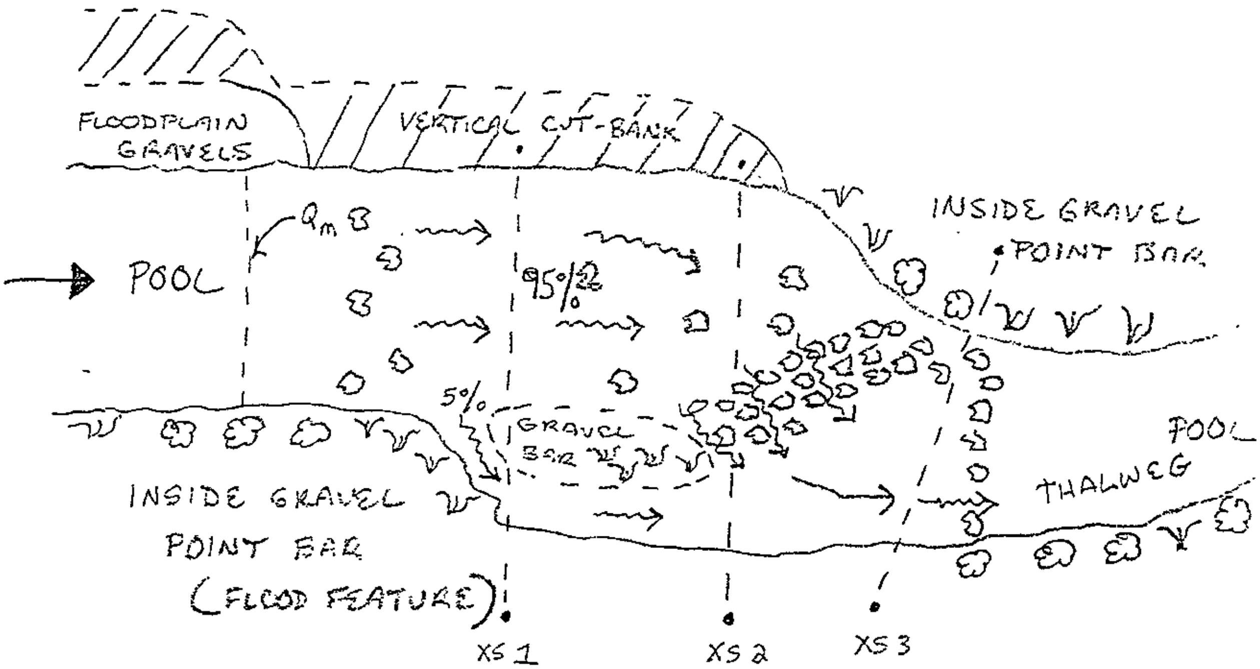
— o —

012601-26

STA	BS	IH	FS	ELEV	WD	Remarks	
			6.145		TOPIN	LEXS 3	
			5.965		TOPIN	REXS 2	15:12

— o —

COYOTE 4


FLOODPLAIN GRAVELS
VERTICAL CUT-BANK
INSIDE GRAVEL POINT BAR
POOL
Q_m
95%
5%
GRAVEL BAR
POOL
THALWEG
INSIDE GRAVEL POINT BAR (FLOOD FEATURE)
XS 1
XS 2
XS 3

APPENDIX D

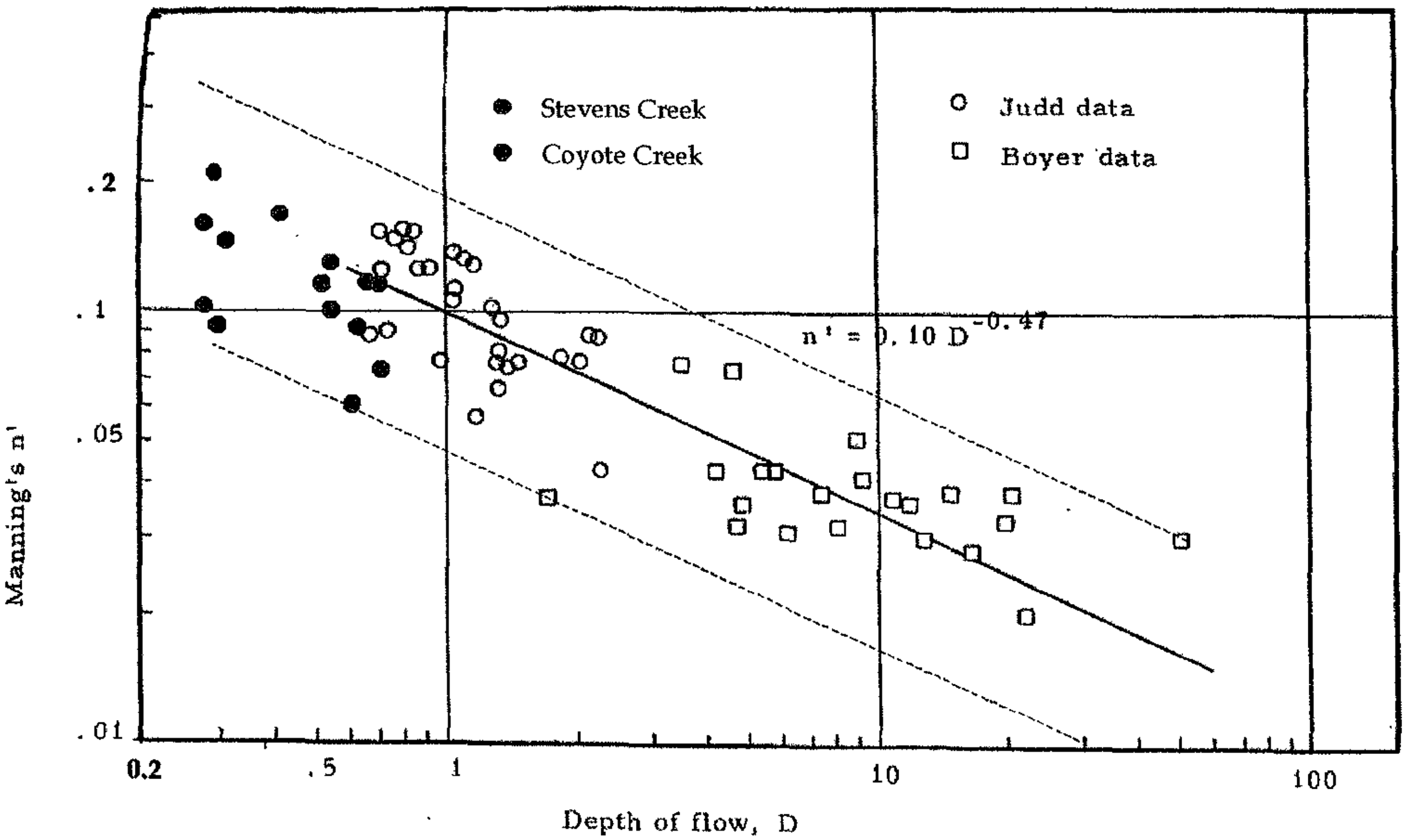


Figure 35. Manning's *n'* compared to depth of flow

Balance Hydrologics, Inc.

Appendix D. Manning's 'n' verses depth of flow, original plot by Judd 1963. Data for Stevens and Coyote Creek were added for comparison and discussion. Data collected during our project fit within the range of values collected by Judd and Boyer and follow the general trend of the regression nicely for increased values of roughness and decreased values of average flow depth. Roughness values calculated with our measurements are much higher than those typically applied to open-channel modeling. However, the relationship illustrated by our data fits reasonable well to Judd and Boyer's data. Similar results were reported by Wolman (1955). However, Wolman's data was described by a power function where 'n' varied by the -0.6 power of average flow depth.

Figure borrowed from Judd 1963